Corporate Finance

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A Dilemma

- CCD has an opportunity to open a shop at IIM Raipur. At the same time, it has another opportunity at IIIT Raipur. Now, CCD comes to you to take your opinion.
- We find that Govt bond and a corporate bond pay-off Rs 1000 after one year from now. We need to decide how much we should pay for both bonds and why?

Introduction to finance

- Finance is the study of value.
- Value creation is about two key components: **Time** and **Uncertainty**.
- It is a way of thinking (common sense), and we deliver how common sense can be translated into numbers in order to support our decisions.
- It is a way of thinking and a set of tools that reflect this way of thinking.
- Takeaway: It can improve your decisions making.

Don’t mistake accounting for finance

Accounting Balance sheet

Liabilities	Assets
Equity	Fixed assets (long-lived real assets)
Debt	Current Assets (Short-lived assets)
Other liabilities	Financial investment
Current assets	Intangible assets (Patents &trademarks)

The financial balance sheet

Liabilities	Assets
Equity (Residual Claim on cash flows, Perpetual lives)	Assets in place (Existing investments
Debt (Fixed claim on cash flows, Fixed life)	Growth assets (Expected value that will be created by future investments)

Corporate Finance: The Big Picture

Maximize the value of the business (firm)

The Investment Decision
Invest in assets that earn a return greater than the minimum acceptable hurdle rate

The Financing Decision
Find the right kind of debt for your firm and the right mix of debt and equity to fund your operations

The Dividend Decision
If you cannot find investments that make your minimum acceptable rate, return the cash to owners of your business

The hurdle rate should reflect the riskiness of the investment and the mix of debt and equity used to fund it.

The return should reflect the magnitude and the timing of the cashflows as well as all side effects

The optimal mix of debt and equity maximizes firm value

How you choose to return cash to the owners will depend on whether they prefer dividends or buybacks

Time value of money

- (Virtually) every decision involves **time** and **uncertainty**.
- **Time value of money** is very important to understand the impact of just the passage of time on decision.
- The time value of money (TVM) is the concept that money available at the present time is worth more than the identical sum in the future due to its potential earning capacity, such as interest rate you are going to earn on your money.
  - Assume you have the option to choose between receiving $10,000 now versus $10,000 in two years. It's reasonable to assume most people would choose the first option

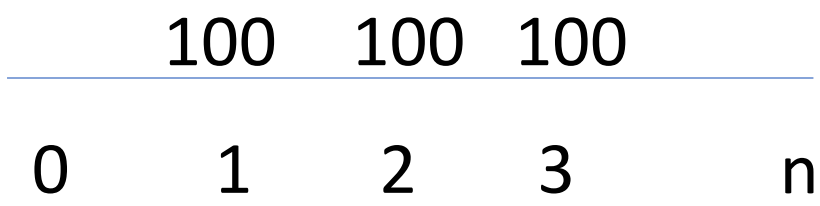
Time value of money: Some terminology

- PV=present value (Rs): the value of money today
- FV=future value (Rs): the value of money in future
- t=# of periods (#)
- r=Interest rate (%)>0 (assumption)
- Remember, no uncertainty for now!

Time value of money: Interest rate

- How much you need to be offered?
  - How strong your preference for current consumption over future. consumption: the strong preference of current consumption leads to higher real interest rate.
  - Once we add expected inflation with real interest rate, it is called nominal interest rate.
- Economists and government officials have been motivating for current consumption that has led American families to save less and consume more of their income, even future income. Keeping everything constant, interest rate in US is expected be lower compared to India.

Important of Timelines!



At different points of time cash flows cannot be compared to each other.

Simple future value

1. Suppose a bank pays 10% interest rate per year and you are given a choice between two plans. Which option would you prefer?
   A. Receive Rs 100 Today
   B. Receive Rs 100 one year from now

Time period: 0		1
(A)	Rs 100	
(B)		Rs 100

-Future value=Initial payment plus accumulated interest

FV=P + r*P= P*(1+r)

100=100 +10%*100=100*(1+10%)

Simple future value

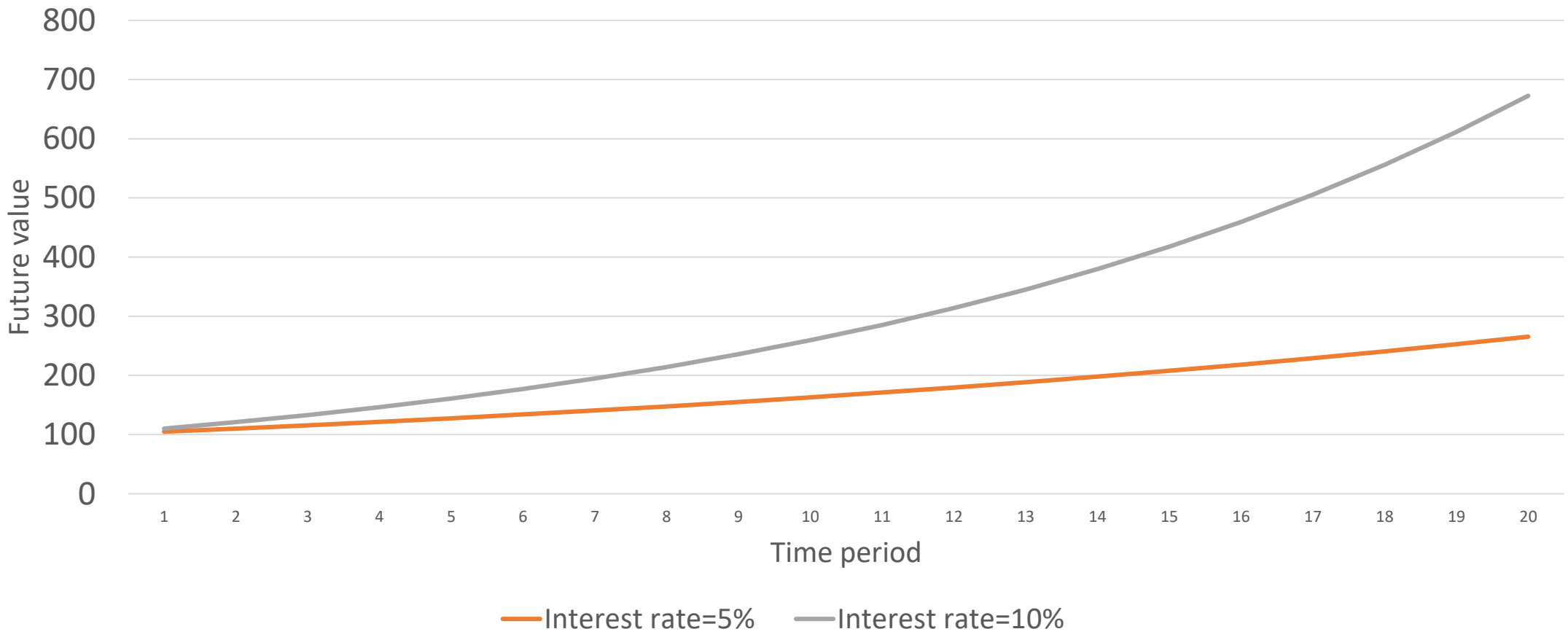
1. If we invest Rs. 100 for next 2 years and interest rate is 10%, what would be value of money after 2 years?

Timeline-

0	1	2
100	110	121
	=100*(1+10%)	=110*(1+10%)
	=100*(1+10%)*(1+10%)=100*(1+10%)^2	

- FV= $PV * (1 + r)^n$

Power of compounding



Future value: Example

- Suppose you invest Rs 500 in the bank at an interest rate of 7%? How much would you get after 10 years?
  - $500 * (1 + 0.07)^{10} =$ Rs 802.89

Simple present value

- Assume that you require Rs. 110 after 1 years from now, how much should you invest now if interest rate is 10%?
- $110 = PV * (1 + 10\%)$
- PV=$\frac{FV}{(1+r)} = \frac{110}{(1+10\%)} = Rs\ 100$
- The discounting enables you to compare future value with current value.
- You have two options. First, you would receive Rs. 11000 after 10 years from now and second Rs 5000 now. Which option would you choose if interest rate is 10%?
- $= \frac{11000}{(1+10\%)\text{^}10} = Rs.4240.976$ (bring capital from future to present)
- =5000*(1+10%)^10=Rs 12968.71(taking capital from present to future)

The frequency of discounting and compounding

- Consider the investment of Rs. 50,000 in the bank earning 6% a year that is compounded every six months. What would the value of your money after 10 years from now?
- r for six months=$\frac{6\%}{2}$=3%
- n: 10*2=20
- FV=50,000*(1+3%)^20=Rs 90305.6
- Effective interest rate=((1 + $\frac{r}{m}$)^m)-1: m equals to number of compounding in a year.
- =$\left(1+\frac{6\%}{2}\right)^2-1$ =6.09%:
- =50000*(1+6.09%)^10=Rs 90305.6

The frequency of discounting and compounding

- Assume that you are comparing interest rates on several loans, with different banks. The first bank has 8% interest rate, with compounding occurring every month. The second bank has 7.98% interest rate, with compounding occurring every week. The third bank has 7.97% interest rate, with daily compounding. Which is the cheapest loan?

Interest rate	Number of frequency	Effective interest rate
8%	12	8.30%
7.98%	52	8.30%
7.97%	365	8.30%

Time value of money: Annuities

- An annuity is a steam of constant cashflows that occur regular intervals for a fixed period of time, such as bank recurring deposit (RD).
- Consider you invest Rs 100 the end of every year for the next 3 years in the bank. The bank offers you 10% interest per year. What would be the value of your investment after 3 years

Year	Interest rate	Cash flow	Years to end n	Future value
0	10%	0	3	0
1	10%	100	2	121
2	10%	100	1	110
3	10%	100	0	100
			Total	331

Future value of an annuity: Formula

- $FV = C * (1+r)^2 + C * (1+r)^1 + C$
- $FV = C * ((1+r)^2 + (1+r)^1 + 1)$
- F$V = C * ((1+r)^{n-1} + (1+r)^{n-2} \ldots \ldots + 1)$
- FV=$C * (\frac{(1+r)^n - 1}{r})$
- $=100 * (\frac{(1+10\%)^3 - 1}{10\%})$=Rs 331

Retirement planning…

- In India PPF offers 8% interest per year to employees. What would the value of my investment, if I invest Rs 1,00,000 per year, at the time of my retirement (age of 60 years), now my age is 35 years. What if I invest same amount in bank RD that also offers 8% interest, but interest income is taxable @ 30%.
- $= 1{,}00{,}000 * (\frac{(1+8\%)^{25}-1}{8\%})$=Rs 73,10,594
- Interest earns= Rs 73,10,594 -(Rs 100000*25)=Rs 4810594
- Income tax paid= 4810594 * 30% =Rs 1443178
- Value of investment after Income tax= Rs 73,10,594 - Rs 1443178=Rs 5867415.8

Son’s education plan…

- I need Rs 20,00,000 after ten years for my son education from now. How much would I need to save each year? Assume interest rate, 8%.
- $C * (\frac{(1+8\%)^{10}-1}{8\%})$=Rs 20,00,000
- C=Rs 1,38,059

Time value of money: present value annuities

- You are owner of Firm A and that you have a choice of buying a copier for RS 12000 in cash or paying Rs. 3000 a year for five year for the same copier. If the discount rate is 10%, which option would you rather do?

Year	Interest rate	Cash flow	Years to end n	Present value
0	10%	0	0	0
1	10%	3000	1	2727
2	10%	3000	2	2479
3	10%	3000	3	2254
4	10%	3000	4	2049
5	10%	3000	5	1863
			Total	11372

Present value annuities: formula

- PV= $\frac{C}{(1+r)^1} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \frac{C}{(1+r)^4} + \frac{C}{(1+r)^5}$
- PV= $C * (\frac{1}{(1+r)^1} + \frac{1}{(1+r)^2} + \frac{1}{(1+r)^3} + \frac{1}{(1+r)^4} + \frac{1}{(1+r)^5})$
- PV=C*$\frac{(1+r)^n - 1}{r*(1+r)^n}$
- PV=3000*$\frac{(1+10\%)^5 - 1}{10\%*(1+10\%)^5}$ =Rs 11372

How are they making money?

- Your state mandates that 50% of lottery revenues should go toward education. Can a lottery pay out Rs 40 million in prizes on ticket sale of Rs 35 million and still claim to generate profit? Assume that the lottery prize would be paid in 20 equal installments and interest rate is 10%.
- Equal installment amount=40/20=Rs 2 million
- = 2*$\frac{(1+10\%)^{20}-1}{10\%*(1+10\%)^{20}} = Rs\ 17.03\ million$
- Revenue after tax=Rs 35*0.5=Rs. 17.50 million
- Profit= 17.50– Rs.$17.02 = Rs\ 0.47\ million$

Time value of money: Annuities

- Ramesh wants to make a trust in order to provide a Ramesh prize of Rs 1,00,000 to the best Student every year for perpetuity. In order to achieve this goal, he would like to invest in fixed deposits. If it is expected that fixed deposits offer 10% per year, how much should he invest to accomplice his goal?

- $= \frac{C}{r} = \frac{Rs\ 100000}{10\%} = Rs$ 10,00,000

Car loan

- You borrow Rs 1,00,000 to buy the car for the next years. If the bank charges 10% interest rate. What should be your equal annual installment?
- $=C*\frac{(1+10\%)^5-1}{10\%*(1+10\%)^5}$ =Rs 1,00,000
- C=Rs. 26, 379.75

Car Loan amortization table

Year	Beginning balance	Yearly payment	Interest amount	Principal repayment
1	100000	26380	10000	16380
2	83620	26380	8362	18018
3	65603	26380	6560	19819
4	45783	26380	4578	21801
5	23982	26380	2398	23982

Investment principal: Risk and return models

Return measure

The stock price for Stock A was $10 per share 1 year ago. The stock is currently trading at $9.50 per share and shareholders just received a $1 dividend. What return was earned over the past year?

$$Return = \frac{Dividend + stock\ price_{t+1}}{Stock\ price_t} - 1$$

$$R = \frac{\$1.00 + \$9.5}{\$10.00} - 1 = 5\%$$

The notion of a benchmark

- Since financial resources are finite, there is an expected return that projects have to cross a hurdle rate (expected return of investors) before being deemed acceptable.
- This expected return (hurdle rate) will be higher for riskier projects than for safer projects.
- A simple representation of the expected return is a follows

  Expected return=Risk-free rate + Risk premium

  Expected return=Time compensation + Risk compensation
- The two basic questions that every risk and return model in finance tries to answer are:
  - How do you measure risk?
  - How do you translate this risk measure into a risk premium?

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.

风险

- The first symbol is the symbol for “ danger”, while the second is the symbol for “opportunity”, making risk a mix of danger and opportunity. You cannot have one, without the other.
- Risk is therefore neither good nor bad. It is just a fact of life. The question that businesses have to address is therefore not whether to avoid risk but how best to incorporate it into their decision making.

A good risk and return model should..

1. It should come up with **a measure of risk that applies to all assets and not be asset-specific.**
2. It should clearly define **what types of risk are rewarded** and what are not, and provide a rationale for the definition.
3. It should come up with **standardized risk measures**, i.e., an investor presented with a risk measure for an individual asset should be able to draw conclusion about whether the asset is above-average or below average-risk.
4. It should translate the **measure of risk into a rate of return** that the investor should demand as compensation for bearing the risk
5. It should **work well not only at explaining past returns**, but also in predicting future expected returns.

Defining risk: Standard deviation

Standard deviation is a measure of how each value in a data set varies or deviates from the mean

1. Find the mean of the set of data: $\bar{x}$
2. Find the difference between each value and the mean: $x - \bar{x}$
3. Square the difference: $\overline{(x - x)^2}$
4. Find the average (mean) of these squares:

$$\frac{\sum (x - \bar{x})^2}{n}$$

5. Take the square root to find the standard deviation

$$\sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

Standard Deviation

Find the mean and the standard deviation for the values 78.2, 90.5, 98.1, 93.7, 94.5.

$$\bar{x} = \frac{(78.2 + 90.5 + 98.1 + 93.7 + 94.5)}{5} = 91$$

Find the mean.

Organize the next steps in a table.

x	$\bar{x}$	$x - \bar{x}$	$(x - \bar{x})^2$
78.2	91	–12.8	163.84
90.5	91	–0.5	.25
98.1	91	7.1	50.41
93.7	91	2.7	7.29
94.5	91	3.5	12.25

$$\sigma = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}}$$

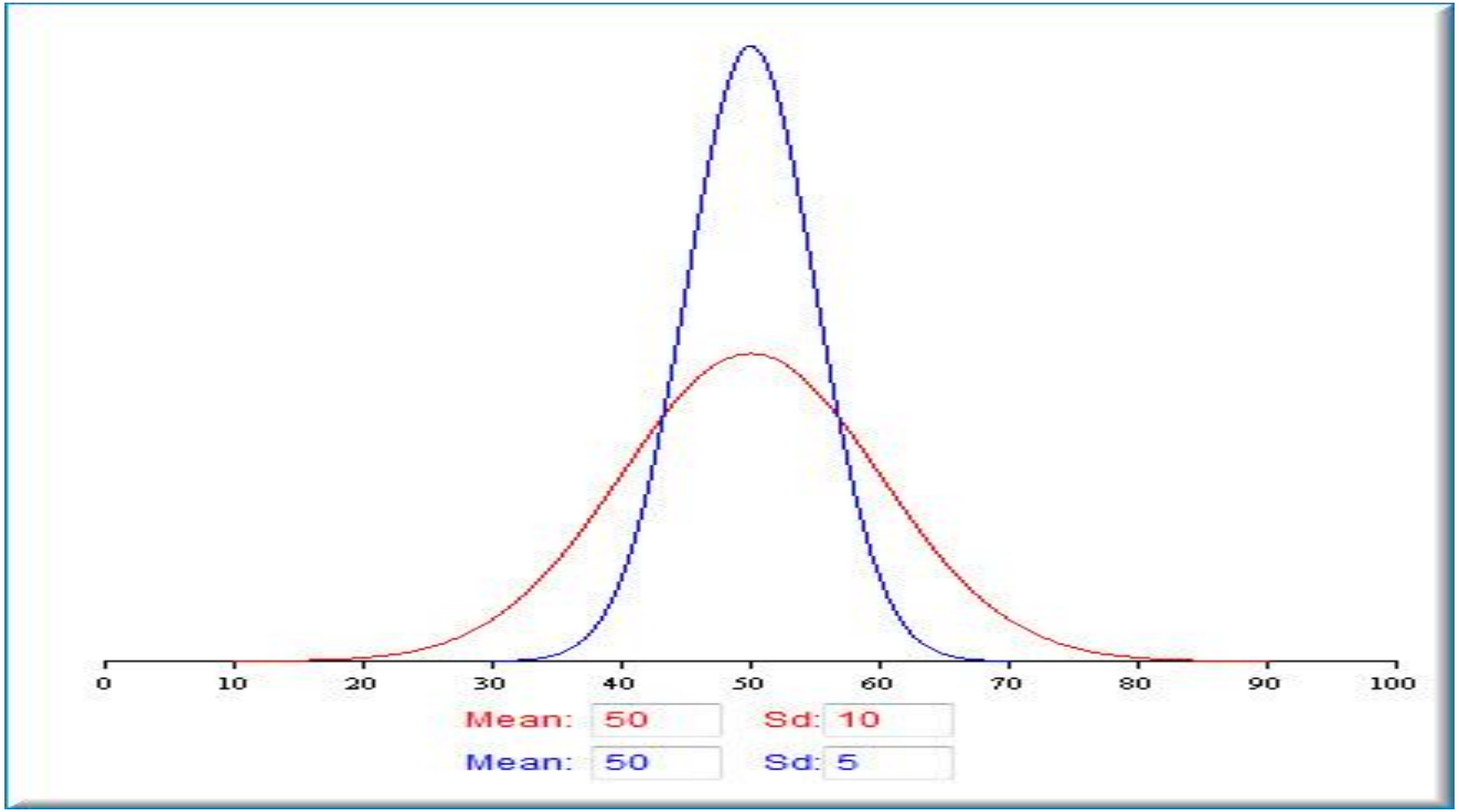
Find the standard deviation.

$$= \sqrt{\frac{234.04}{5}} \approx 6.8$$

The mean is 91, and the standard deviation is about 6.8.

The mean-variance framework

The variance on any investment measures the disparity between actual and expected returns



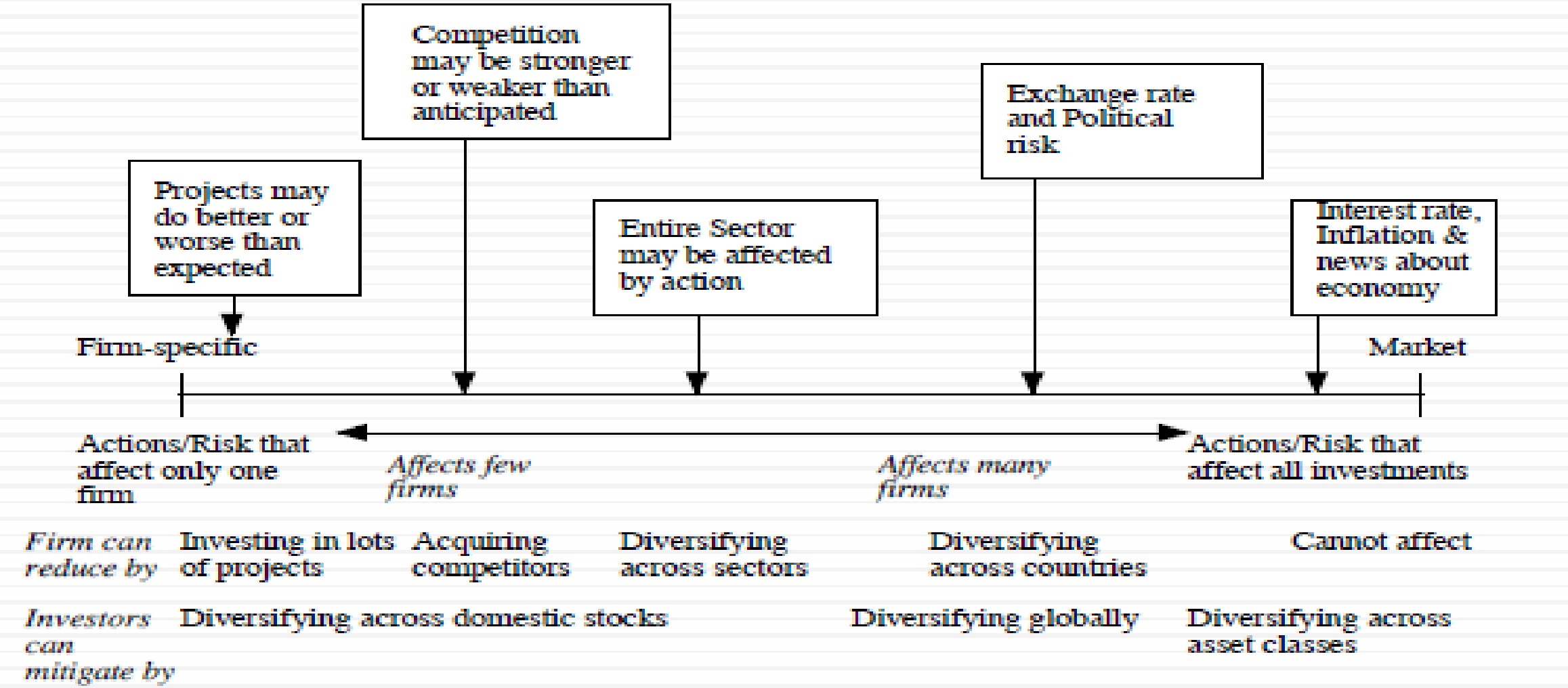
How risky is TCS: A look at the past

Standard deviation of TCS

Daily Std dev=1.42%

Date	Adj Close	Log(return)	Simple return
10/3/2017	1198.726		
10/4/2017	1196.522	-0.18%	-0.18%
10/5/2017	1190.438	-0.51%	-0.51%
10/6/2017	1197.786	0.62%	0.62%
10/9/2017	1201.421	0.30%	0.30%
10/10/2017	1204.85	0.29%	0.29%
10/11/2017	1224.905	1.65%	1.66%
10/12/2017	1248.448	1.90%	1.92%
10/13/2017	1252.464	0.32%	0.32%
10/16/2017	1266.347	1.10%	1.11%
10/17/2017	1271.197	0.38%	0.38%
10/18/2017	1268.287	-0.23%	-0.23%
10/19/2017	1264.309	-0.31%	-0.31%

The importance of diversification: Risk types



Risk measures

- How to measure riskiness?
  - Firm A with the number of shareholders is 1 million.
  - Firm B with the number of shareholders is 10.
- For widely-held public firms, discount date should reflect the risk perceived by the **marginal investor (**You have a lot of stocks (different firms) and trade them**)**
  - Macro uncertainly (Systematic risk)
  - Micro uncertainty (Unsystematic risk)
- Discrete versus continuous uncertainty
  - **Discreate risk**: Risks that lie dormant for period but show up at points in time (Example: Brexit; financial crisis; distress risk, etc.,).
  - **Continuous risk:** Risks changes in interest rate or economic growth occur continuously and affect value they happen.

Why diversification reduces/eliminates firm-specific risk?

- Firm-specific risk can be reduced, if not eliminated, by increasing the number of investments in your portfolio. Market-wide risk cannot. This can be justified on either economic or statistical grounds.
- On economic grounds, diversifying and holding a larger portfolio eliminant firm-specific risk for two reasons
  - Each investment is a much smaller percentage of the portfolio, reducing the effect (positive or negative) on the overall portfolio.
  - Firm-specific actions can be negative or positive. In a large portfolio, it is argued, these effect will average out to zero. (For every firm, where something bad happens, there will be some other firm, where something good happens.

Riskiness of two assets: Statistical grounds

- Assume we have Rs 10,000 and want to invest in Asset A and B with equal investment.
- We measure expected returns of Asset A and Asset B are 10% and 12%, respectively. Std dev of A and B is 5% and 6%.
- Expected return of investment (portfolio)=0.50*10%+0.50*12%=11%
- How to calculate the riskiness of portfolio?.
  - I want to evaluate two students in a team. In such a case, I have to consider their individual performance in a team, plus their relationship each other.

How to measure relationship : Covariance

Covariance measures the strength and the direction of the relationship between the elements of two stock, and the correlation is derived from the covariance

Computing the Sample Covariance

Year	Excelsior Corp Annual Return (percent)	Adirondack Corp Annual Return (percent)	$(X_i - \bar{X})$	$(Y_i - \bar{Y})$	$(X_i - \bar{X})(Y_i - \bar{Y})$
2008	1	3	$1-1=0$	$3-3=0$	$(0)(0)=0$
2009	–2	2	$-2-1=-3$	$2-3=-1$	$(-3)(-1)=3$
2010	3	4	$3-1=2$	$4-3=1$	$(2)(1)=2$
2011	0	6	$0-1=-1$	$6-3=3$	$(-1)(3)=-3$
2012	3	0	$3-1=2$	$0-3=-3$	$(2)(-3)=-6$
Mean	**1**	**3**		**Sum**	**−4**

$$s_{XY} = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{n-1}$$

$$covarinace = \frac{-4}{5-1} = -1$$

How to measure relationship : Correlation

- Correlation=$\frac{covariance_{a,b}}{std_a * std_b}$
- Std of Excelsior=4.5%
- Std of Andirondack=2.2361%
- $Correlation = \frac{-1\%}{4.5\% * 2.2361\%} = -0.2108$

Portfolio risk

- Portfolio variance=$w_1^2 * \sigma_A^2 + w_2^2 * \sigma_B^2 + 2 * \rho_{A,B*}\sigma_A * \sigma_{dB} * w_1 * w_2$
- Average std dev of portfolio=w* σ_A + w* σ_B
- Now assume, Asset A and B has correlation=0.50
- Portfolio variance= $0.5^2 * 5^2 + 0.50^2 * 6^2 + 2 * 0.50 * 5 * 6 * 0.50 * 0.50$=22.75
- Portfolio std. dev=4.77%
- Average std dev=5.5%

With various correlations

Correlation	Portfolio std dev
-1	0.50
-0.9	1.32
-0.8	1.80
-0.7	2.18
-0.6	2.50
-0.5	2.78
-0.4	3.04
-0.3	3.28
-0.2	3.50
-0.1	3.71
0	3.91
0.1	4.09
0.2	4.27
0.3	4.44
0.4	4.61
0.5	4.77
0.6	4.92
0.7	5.07
0.8	5.22
0.9	5.36
1	5.50

Portfolio risk with three stocks

$$\sigma_P = \sqrt{\begin{aligned} &w_A^2\,\sigma^2(k_A) + w_B^2\,\sigma^2(k_B) + w_C^2\,\sigma^2(k_C) + 2\,w_A\,w_B\,R(k_A,k_B)\,\sigma(k_A)\,\sigma(k_B) \\ &+ 2\,w_A\,w_C\,R(k_A,k_C)\,\sigma(k_A)\,\sigma(k_C) + 2\,w_B\,w_C\,R(k_B,k_C)\,\sigma(k_B)\,\sigma(k_C) \end{aligned}}$$

The role of the marginal investor

- The marginal investor in a firm is the investor who is most likely to be buyer or seller on the next trade and to influence the stock prices.
- Generally speaking, the marginal investor in a stock has to own a lot of stock and also trade that stock on regular basis.
- **In all risk and return models in finance, we assume that the marginal investor is well diversified.**

Identifying the marginal investor in your firm

Percent of Stock held by Institutions	Percent of Stock held by Insiders	Marginal Investor
High	Low	Institutional Investor
High	High	Institutional Investor, with insider influence
Low	High (held by founder/manager of firm)	Tough to tell; Could be insiders but only if they trade. If not, it could be individual investors
Low	High (held by wealthy individual investor)	Wealthy individual investor, fairly diversified
Low	Low	Small individual investor with restricted diversification

TCS: Marginal investor

Holder's Name	% Share Holding
Promoters	71.92%
Foreign Institutions	16.59%
Financial Institutions	4.90%
General Public	3.82%
banks &Mutual Funds	1.96%
Others	0.76%
CentralGovt	0.05%

The risk of an Individual Asset

- **The essence**: The risk of any asset is the risk that it adds to the market portfolio. Statistically, this risk can be measured by how much an asset moves with the market (called the covariance).
- **The measure:** Beta is standardized measure of this covariance, obtained by dividing the covariance of any asset with the market by the variance of the market.
- **The result**: the required return on an investment will be a linear function on its beta

Expected return=Risk-free rate + Beta*(Expected return on the market portfolio-Risk-free rate)

The Capital Asset Pricing Model

- Specifies that a portion of variance can be diversified away, and that is only the non-diversified portion that is rewarded.
- Measures the non-diversified risk with beta, which is standardized around one.
- Translates beta into expected return

    - Expected return=Risk-free rate + Beta*Risk premium

How are betas calculated?

- The standard procedure for estimating betas is to regress stock returns (Rj) against market returns (Rm):

$$Rj = a + b\ Rm$$

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

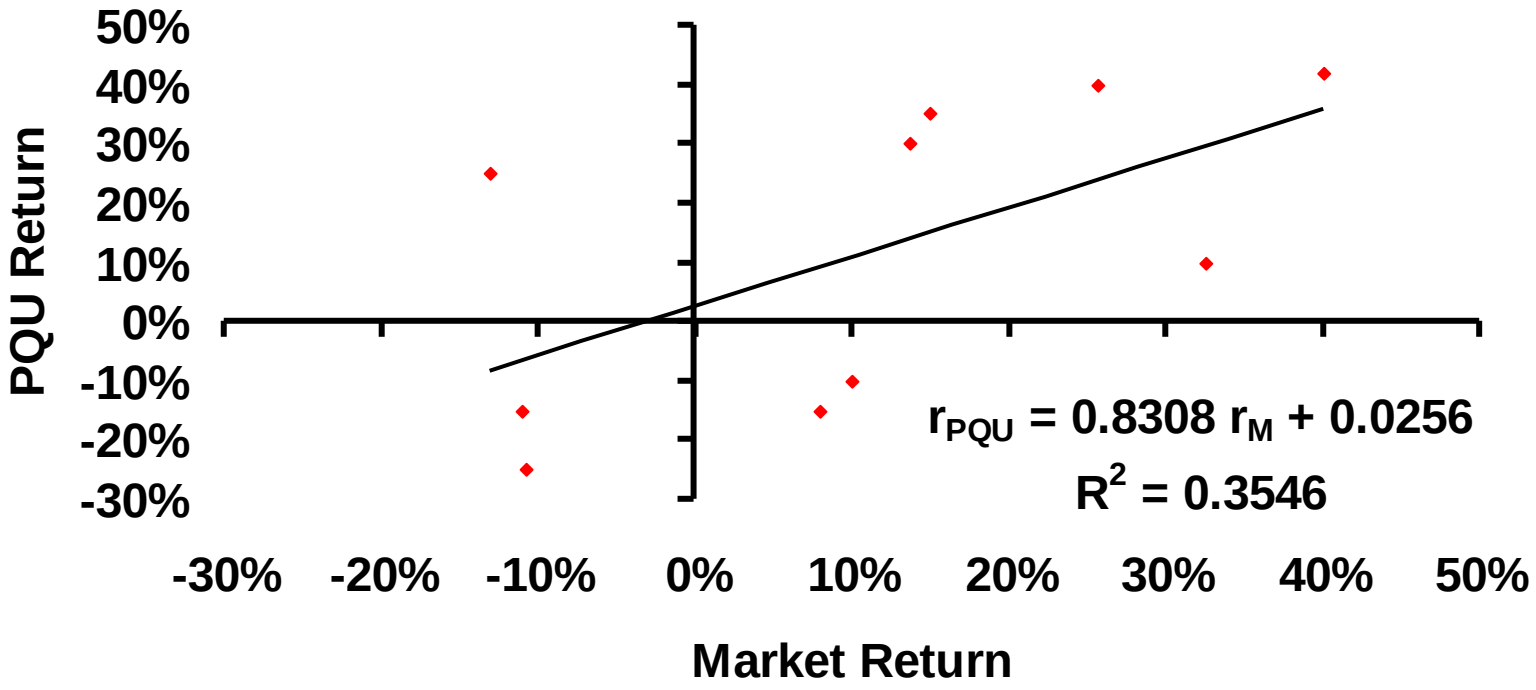
The slope of the regression corresponds to the beta of the stock and measures the riskiness of the stock.

The R squared (R2) 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 - R2) can be attributed to firm specific risk.

Use the historical stock returns to calculate the beta for PQU.

Year	Market	PQU
1	25.7%	40.0%
2	8.0%	-15.0%
3	-11.0%	-15.0%
4	15.0%	35.0%
5	32.5%	10.0%
6	13.7%	30.0%
7	40.0%	42.0%
8	10.0%	-10.0%
9	-10.8%	-25.0%
10	-13.1%	25.0%

Calculating Beta for PQU



Beta & PQU Co.

- Beta reflects slope of line via regression
- Rpqu = 0.8308 rM + 0.0256
- So, PQU's beta is .8308 & y-intercept @ 2.56%
- PQU's R^2 of .3546 means about 35% of PQU's returns are explained by the market returns
- This implies that
  - 35.46% of the risk at PQU Co comes from market sources
  - 64.56%, therefore, comes from firm-specific sources
- The firm-specific risk is diversifiable and will not be rewarded.

More on beta concept..

- Beta of a stock=$\frac{\text{Covarinance}_{i,m}}{\text{Market variance}}$=$\text{Correlation}_{i,m} * \frac{\sigma_i}{\sigma_m}$

Determinates of beta

Beta of equity (Levered Beta)

Beta of Business (Unlevered Beta

Assuming that total risk is born by only equity holders

Financial leverage

$$\beta_e = \beta_a(1 + \frac{D}{E} * (1 - t))$$

Nature of product or service offered by firm: High elasticity (discretionary) of demand of your product would have higher beta

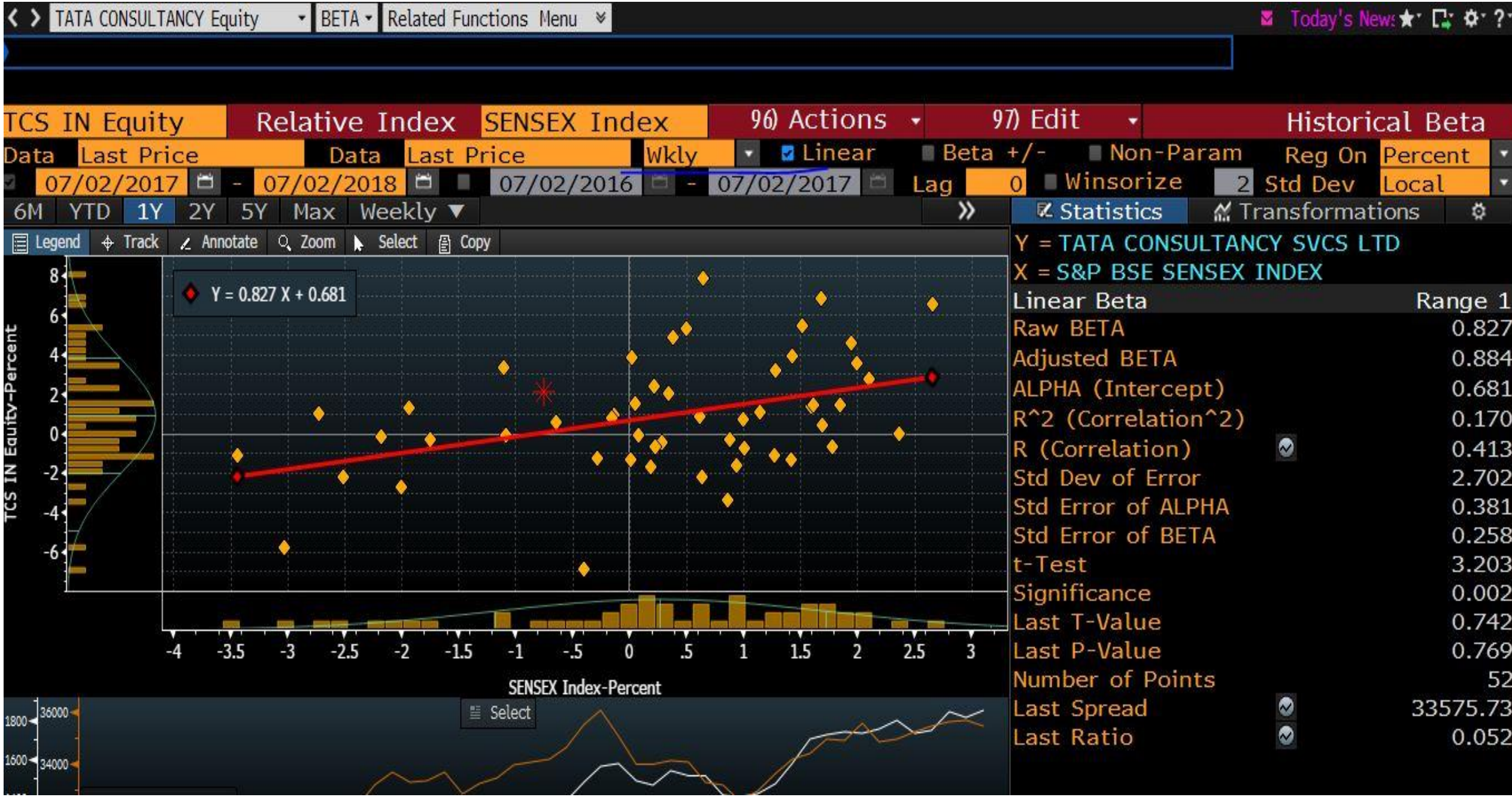
Operating leverage (Fixed Costs as % of total costs)

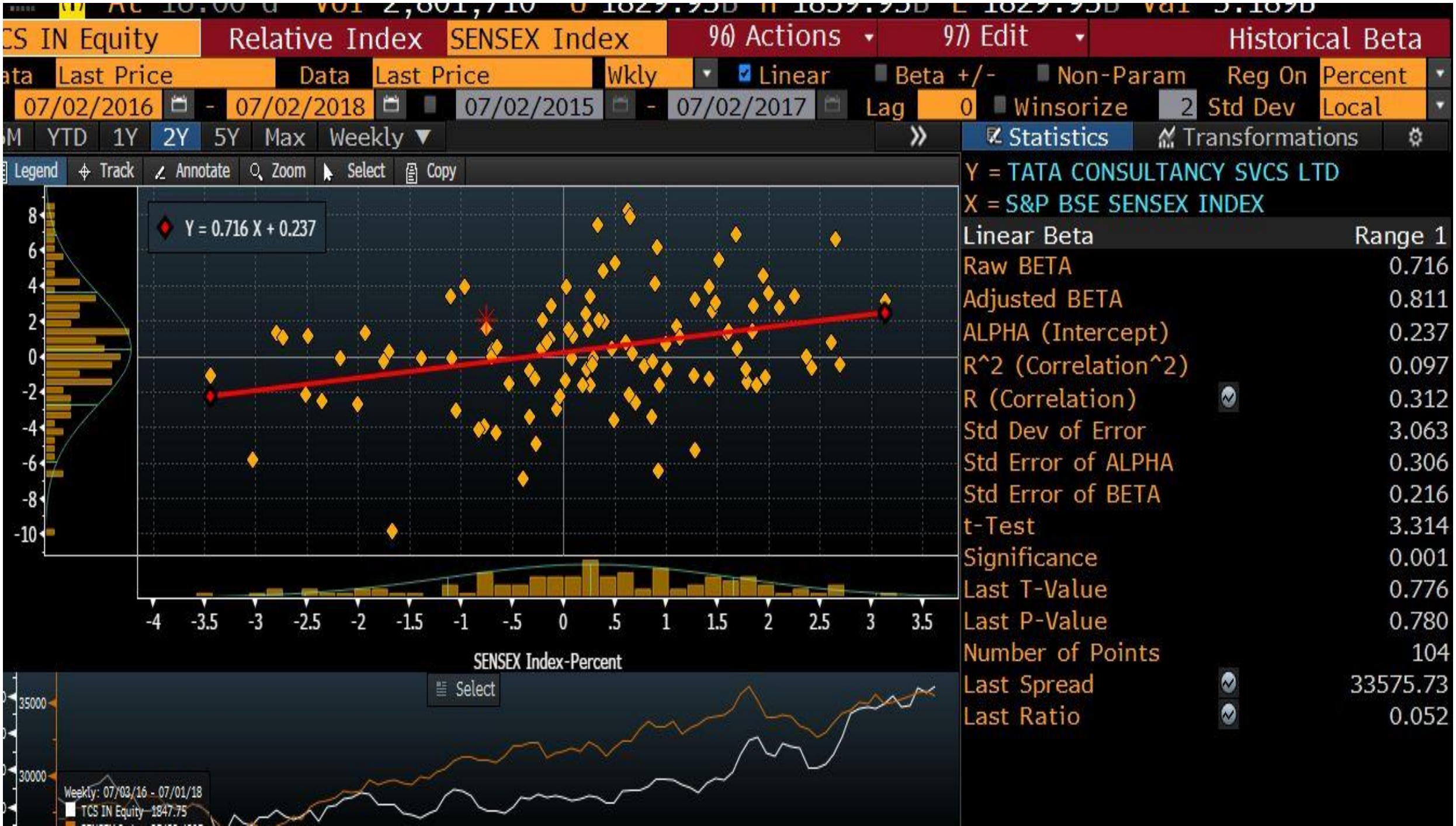
1. Cyclical firms should have higher beta than non-Cyclical firms .
2. Luxury Goods firms should have higher beta than basic goods
3. High priced goods/service firms should have higher betas than low prices goods/service.
4. Growth firms should have higher beta

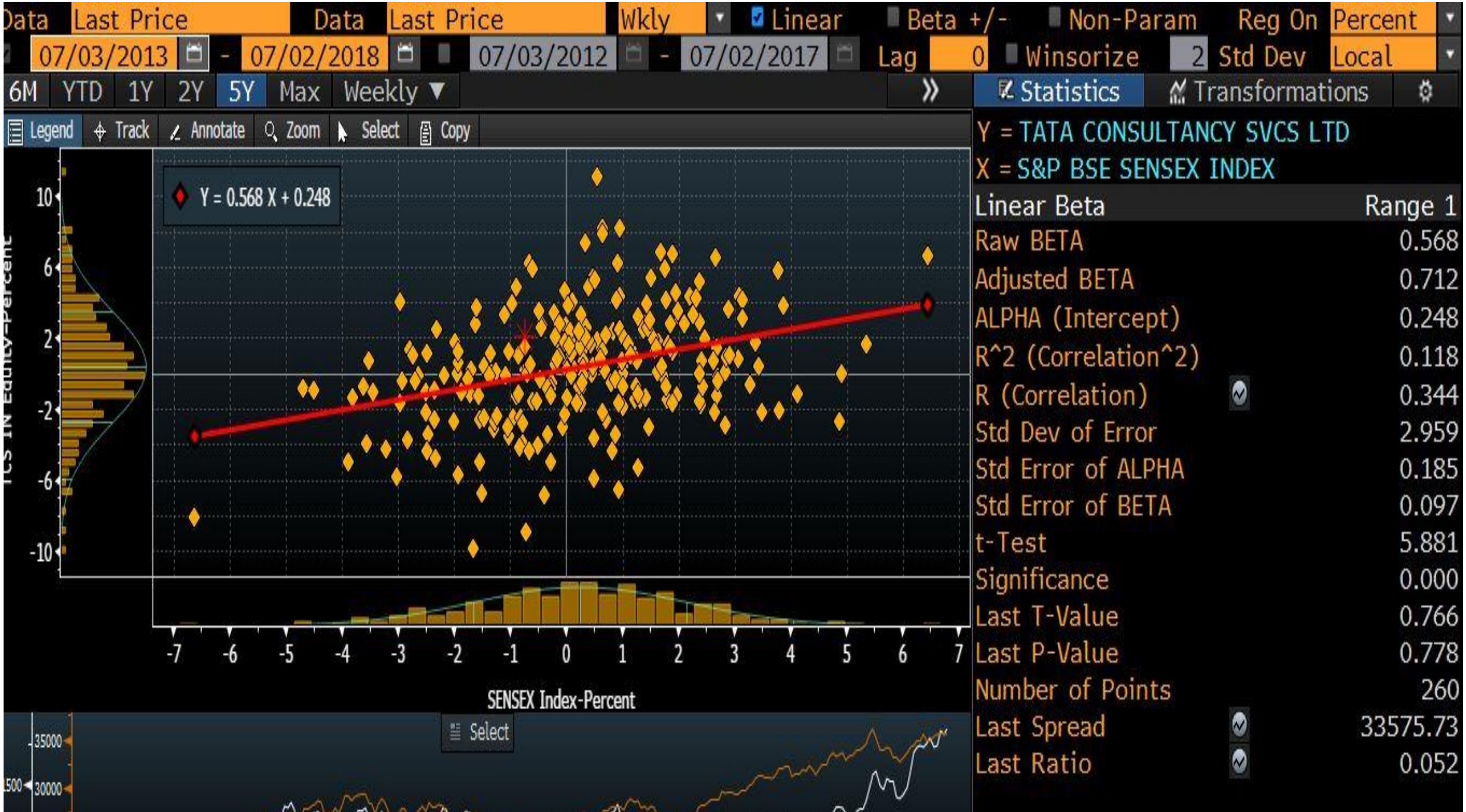
1. Firms with high infrastructure needs and rigid costs structures should have higher betas than firms flexible cost structures
2. Smaller firms should have higher betas than larger firms.
3. Young firms should have higher betas than more mature firms

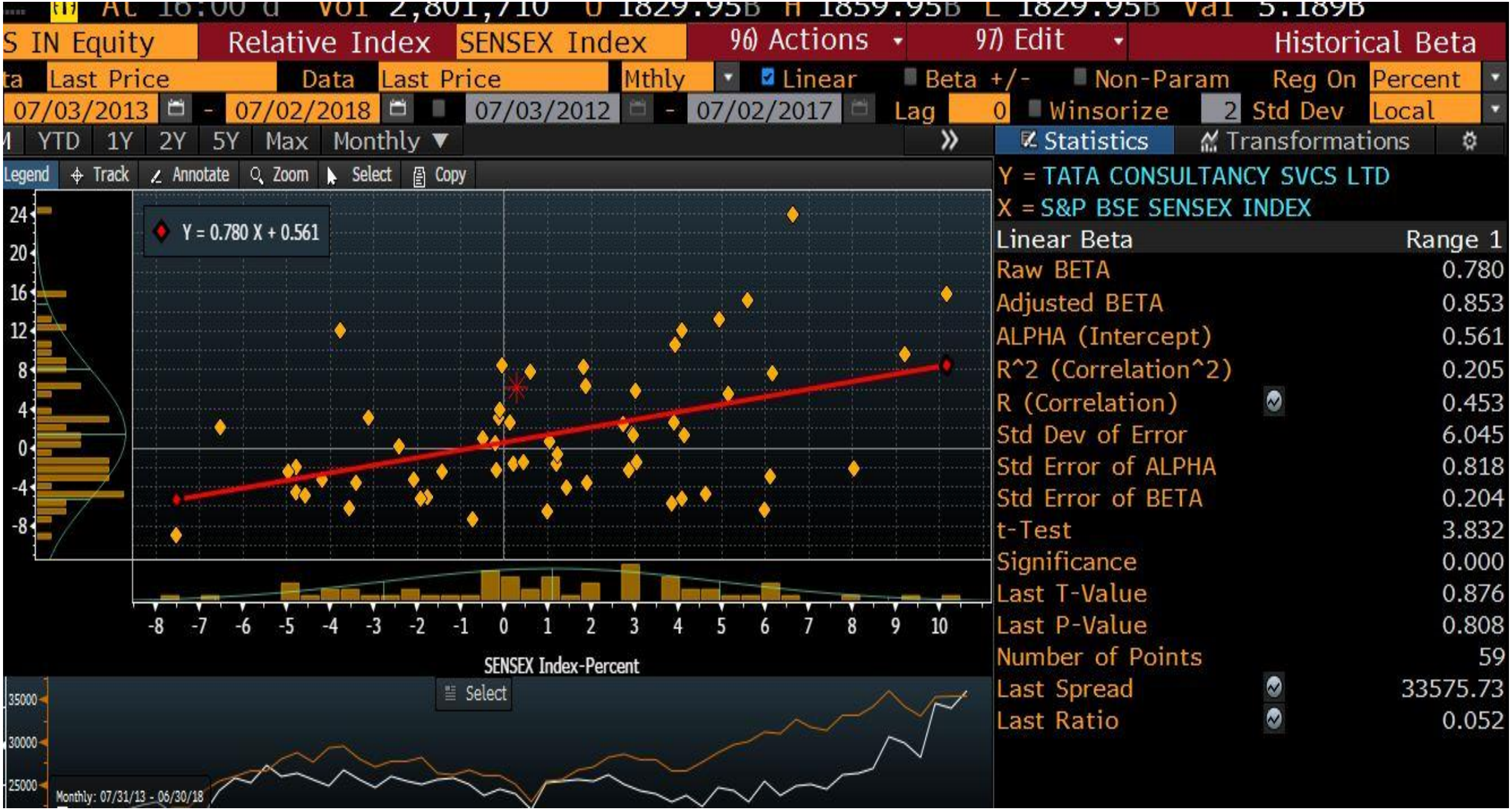
Setting up for the Estimation

- 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 over time.
  - Shorter periods can be affected more easily by significant firm-specific event that occurred during the period.
- 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. ¨ ¨
- Choose a market index and estimate returns (inclusive of dividends) on the index for each interval for the period.


TATA CONSULTANCY Equity
BETA
Related Functions Menu
Today's News
TCS IN Equity
Relative Index
SENSEX Index
96) Actions
97) Edit
Historical Beta
Data
Last Price
Data
Last Price
Wkly
Linear
Beta +/-
Non-Param
Reg On
Percent
07/02/2017
07/02/2018
07/02/2016
07/02/2017
Lag
0
Winsorize
2
Std Dev
Local
6M
YTD
1Y
2Y
5Y
Max
Weekly
Statistics
Transformations
Legend
Track
Annotate
Zoom
Select
Copy
Y = 0.827 X + 0.681
TCS IN Equity-Percent
SENSEX Index-Percent
Y = TATA CONSULTANCY SVCS LTD
X = S&P BSE SENSEX INDEX
Linear Beta
Range 1
Raw BETA
0.827
Adjusted BETA
0.884
ALPHA (Intercept)
0.681
R^2 (Correlation^2)
0.170
R (Correlation)
0.413
Std Dev of Error
2.702
Std Error of ALPHA
0.381
Std Error of BETA
0.258
t-Test
3.203
Significance
0.002
Last T-Value
0.742
Last P-Value
0.769
Number of Points
52
Last Spread
33575.73
Last Ratio
0.052


CS IN Equity
Relative Index
SENSEX Index
96) Actions
97) Edit
Historical Beta
Last Price
Data
Last Price
Wkly
Linear
Beta +/-
Non-Param
Reg On
Percent
07/02/2016
07/02/2018
07/02/2015
07/02/2017
Lag
0
Winsorize
2
Std Dev
Local
YTD
1Y
2Y
5Y
Max
Weekly
Statistics
Transformations
Legend
Track
Annotate
Zoom
Select
Copy
Y = 0.716 X + 0.237
SENSEX Index-Percent
Select
Weekly: 07/03/16 - 07/01/18
TCS IN Equity 1847.75
Y = TATA CONSULTANCY SVCS LTD
X = S&P BSE SENSEX INDEX
Linear Beta
Range 1
Raw BETA 0.716
Adjusted BETA 0.811
ALPHA (Intercept) 0.237
R^2 (Correlation^2) 0.097
R (Correlation) 0.312
Std Dev of Error 3.063
Std Error of ALPHA 0.306
Std Error of BETA 0.216
t-Test 3.314
Significance 0.001
Last T-Value 0.776
Last P-Value 0.780
Number of Points 104
Last Spread 33575.73
Last Ratio 0.052


Data Last Price
Data Last Price
Wkly
Linear
Beta +/-
Non-Param
Reg On
Percent
07/03/2013 - 07/02/2018
07/03/2012 - 07/02/2017
Lag 0
Winsorize 2 Std Dev
Local
6M YTD 1Y 2Y 5Y Max Weekly
Statistics
Transformations
Legend Track Annotate Zoom Select Copy
Y = 0.568 X + 0.248
TCS IN Equity-Percent
SENSEX Index-Percent
Select
Y = TATA CONSULTANCY SVCS LTD
X = S&P BSE SENSEX INDEX
Linear Beta Range 1
Raw BETA 0.568
Adjusted BETA 0.712
ALPHA (Intercept) 0.248
R^2 (Correlation^2) 0.118
R (Correlation) 0.344
Std Dev of Error 2.959
Std Error of ALPHA 0.185
Std Error of BETA 0.097
t-Test 5.881
Significance 0.000
Last T-Value 0.766
Last P-Value 0.778
Number of Points 260
Last Spread 33575.73
Last Ratio 0.052


Vol 2,801,710
S IN Equity
Relative Index
SENSEX Index
96) Actions
97) Edit
Historical Beta
Last Price
Data
Last Price
Mthly
Linear
Beta +/-
Non-Param
Reg On
Percent
07/03/2013
07/02/2018
07/03/2012
07/02/2017
Lag
0
Winsorize
2
Std Dev
Local
YTD
1Y
2Y
5Y
Max
Monthly
Statistics
Transformations
Legend
Track
Annotate
Zoom
Select
Copy
Y = 0.780 X + 0.561
SENSEX Index-Percent
Select
Monthly: 07/31/13 - 06/30/18
Y = TATA CONSULTANCY SVCS LTD
X = S&P BSE SENSEX INDEX
Linear Beta
Range 1
Raw BETA 0.780
Adjusted BETA 0.853
ALPHA (Intercept) 0.561
R^2 (Correlation^2) 0.205
R (Correlation) 0.453
Std Dev of Error 6.045
Std Error of ALPHA 0.818
Std Error of BETA 0.204
t-Test 3.832
Significance 0.000
Last T-Value 0.876
Last P-Value 0.808
Number of Points 59
Last Spread 33575.73
Last Ratio 0.052


S IN Equity
Relative Index
SENSEX Index
96) Actions
97) Edit
Historical Beta
Last Price
Data
Last Price
Daily
Linear
Beta +/-
Non-Param
Reg On
Percent
07/03/2013
07/02/2018
07/03/2012
07/02/2017
Lag
0
Winsorize
2
Std Dev
Local
YTD
1Y
2Y
5Y
Max
Daily
Statistics
Transformations
Legend
Track
Annotate
Zoom
Select
Copy
Y = 0.554 X + 0.055
SENSEX Index-Percent
Select
Daily: 07/03/13 - 07/02/18
TCS IN Equity 1851.35
SENSEX Index 35264.4102
Y = TATA CONSULTANCY SVCS LTD
X = S&P BSE SENSEX INDEX
Linear Beta
Range 1
Raw BETA 0.554
Adjusted BETA 0.703
ALPHA (Intercept) 0.055
R^2 (Correlation^2) 0.109
R (Correlation) 0.330
Std Dev of Error 1.398
Std Error of ALPHA 0.040
Std Error of BETA 0.045
t-Test 12.254
Significance 0.000
Last T-Value 0.278
Last P-Value 0.609
Number of Points 1234
Last Spread 33413.06
Last Ratio 0.052

TCS Beta

Index	Return Interval	Time period	Beta	Adjusted Beta	S.E	R^2
Sensex	Wkly	1 years	0.827	0.884	0.258	0.17
Sensex	Wkly	2 years	0.716	0.811	0.216	0.097
Sensex	Wkly	5 years	0.568	0.712	0.097	0.118
Sensex	Mthly	5 years	0.78	0.853	0.204	0.205
Sensex	Daily	5 years	0.554	0.703	0.045	0.109
MXWO	Mthly	5 years	0.521	0.68	0.304	0.049

Reliance Industries Ltd (RIL)

Time period	Beta
1-Months	1.19
3-Months	0.91
6-Months	1.09
1 Year	1.06
3 Years	0.98

Reliance Industries Ltd (RIL)

	2013	**2014**	**2015**	**2016**	**2017**	2018
Refining	71.1%	75.9%	72.4%	60.1%	59.4%	53.2%
Petrochemicals	23.1%	18.2%	19.3%	27.9%	26.2%	26.5%
Organized Retail		2.7%	3.8%	7.0%	10.1%	16.0%
Others – Crude Petroleum	3.1%	1.1%	2.1%	2.5%	2.5%	2.1%
Oil & Gas	2.7%	2.0%	2.4%	2.6%	1.6%	1.2%
Digital Services					0.2%	1.1%
D\E ratio		0.28	0.19	0.06	0.04	0.02

Measurement issues

- Choice of a market Index: Ideally, the index should include all market traded assets (bond, equity, real states, gold, etc.,), but don't have this one and that should be market-weighted.
- What should be the return's interval?
- What should be the length of historical data?
- The regression beta has the following three problems?
  - It has high standard error
  - It reflects the firm's business mix over the period of the regression, not current mix (Reliance Jio)
  - It reflects the firm's average financial leverage over the period rather the current leverage.

BSE Sensex (weight)

	Total
Paints & varnishes	1.76%
Banking services	21.44%
Two & three wheelers	3.16%
Boilers & turbines	0.52%
Telecommunication services	2.22%
Drugs & pharmaceuticals	8.56%
Other fund based financial services	1.54%
Natural gas trading & distribution	0.74%
Cosmetics, toiletries, soaps & detergents	2.82%
Housing finance services	7.85%
Tobacco products	8.32%
Computer software	16.61%
Industrial construction	4.52%
Other transport equipment	2.72%
Passenger vehicles	2.18%
Electricity generation	1.26%
Crude oil & natural gas	1.64%
Refinery	7.74%
Commercial vehicles	3.42%
Steel	0.99%

We will use the following way to estimate beta (bottom-up betas.

- Find the business or businesses that you firm operate in.
- Find publicly traded firms (you may go globally) in each of these businesses and obtain their regression betas. Unlever all equity betas to remove capital structure effect. Take the average of all unlevered betas within each business.
- Estimate how much value your firm drives from each of the different businesses it is in.
- Compute a weighted average of the unlevered betas of the different business. Theoretically, we should use the value of business segment. However, this number is not available, we can use revenue of each segment of business.

Adjusting for financial leverage

- Convectional approach: if we assume that debt carries no market risk (has a beta of zero), the beta of equity alone can be written as a function of unlevered beta and debt-equity beta
  - $\beta_L = \beta_u(1 + \left(\frac{D}{E}\right) * (1 - t))$
- Debt adjusted approach: if beta carries market risk and you can estimate the beta of debt, you can estimate the levered beta as follows
  - $\beta_L = \beta_u \left(1 + \left(\frac{D}{E}\right) * (1 - t)\right) - \beta_d * (1 - t)\frac{D}{E}$
-

Why bottom-up betas?

- The bottom-up betas would have significantly lower standard error (more précised) compared to a signal regression beta (?)
  - Std error of bottom-up beta=$\frac{Average\ Std\ error\ across\ betas}{\sqrt{Number\ of\ firms\ in\ sample}}$
- The bottom-up betas can be adjusted to reflect changes in the firm's portfolios and financial leverage.
- You can estimate bottom-up betas even when you do not have historical stock prices. This is the case with IPO, private business or divisions of companies.

Reliance Industries Ltd (RIL)

Segment	Revenue (%)	Unlevered Beta
Refining	53.2%	0.81
Petrochemicals	26.5%	0.81
Organized Retail	16.0%	1
Others - Crude Petroleum	2.1%	0.81
Oil & Gas	1.2%	0.81
Digital Services	1.1%	0.67
	Total Debt/Market cap	0.28
	Unlevered Beta	0.839
	Levered Beta with current D/E	0.99

A Risk-free rate

- On a risk-free asset, the actual return is equal to the expected return: zero standard deviation.
  - If you buy 1-year bond with the expectation of 5% return and the actual return is also turn out to be 5.
  - The returns should be uncorrelated with the risky-investment returns.
- For an investment to be risk-free, then, it must have
  - No default risk
  - No reinvestment risk
    - The expected return over 5 years, Can 6-month TB risk-free?
    - Can the coupon bond with life of 5 years?
- Can we use Indian Govt. bond rate as a Risk-free rate if you want value Indian firms?

A Risk-free rate

- India’s sovereign rating (Moody)=Baa2
- Credit default swap spreads (CDS): an insurance against default. For instance, If I purchase AA bond and that has probability of default. I can buy insurance against the default of the bond. The price I have to pay to buy the insurance is called Credit default swap spreads.

Indian CDS


INDIA CDS USD SR
Republic of India USD Sr C
Actions
98) Table
Settings
Graph Curves
X-Axis Tenor
Y-Axis Mid Spr
Currency None
PCS CMAN
Lower Chart None
Specific MM/DD/YY
Relative Last 1D 1W 1M Modify
Curves & Relative Value
CD2938 Republic of India USD Sr CDS Curve Last Mid Spr
140
120
100
80
60
40
20
6M
1Y
2Y
3Y
4Y
5Y
6Y
7Y
8Y
9Y
10Y
Tenor

A Risk-free rate and cost of equity

- Risk free rate (CDS)=8.08-1.40=6.68%
- Equity risk-premium (current)=4.77% + 1.41%=6.18%
- Cost of Equity (HUL)=6.68% + 6.18%*0.40% =9.2%
- Cost of Equity (TCS)=6.68% + 6.18%*0.54% =10.01%

Valuing Bonds

Valuing Bonds

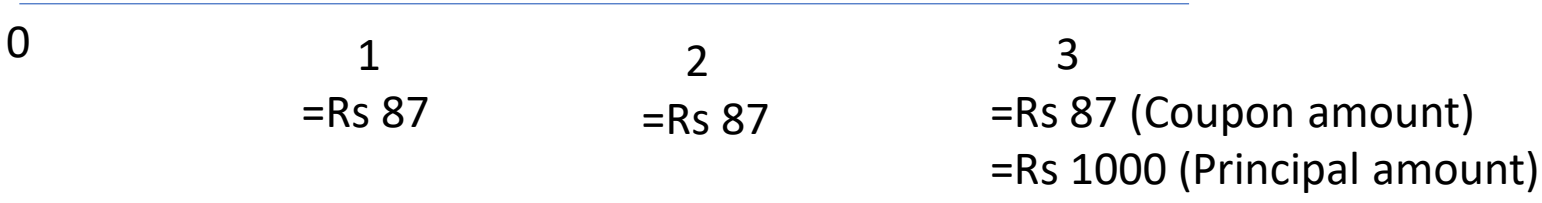
- Bonds, like the world suggests, binds the borrow to the lender in a contract.
- An explicit IOU (I owe you): a promise to pay money in the future in return for the money borrowed.
- Key Bond Characteristics
  - **Face Value:** The face value (also known as the par value) of a bond is the price at which the bond is sold to investors when first issued; it is also the price at which the bond is redeemed at maturity.
  - **Coupon Rate**: The periodic interest payments promised to bond holders are computed as a fixed *percentage* of the bond's face value; this percentage is known as the *coupon rate*.
  - **Maturity:** A bond's maturity is the length of time until the principal is scheduled to be repaid.

Indian Bond market

ssuer	L&T Finance Limited
Type of instrument/ Name of the security/ Seniority	Secured Redeemable Non-Convertible Debentures
ssue Size	Public issue of secured, redeemable non-convertible debentures of face value of Rs 1,000 each for an amount of Rs 500 Crore ("Base Issue Size") with an option to retain oversubscription up to Rs 500 Crore (totaling Rs. 1,000 Crore) within the Shelf limit of Rs. 5,000 Crore.
ssue opens	Monday , 08th April 2019
ssue closes	Thursday, 18th April 2019
Allotment	First Come First Serve Basis, Compulsory in demat form
Face Value	Rs 1000 per NCD
ssue Price	Rs 1000 per NCD
Nature of Instrument	Secured Redeemable Non-Convertible Debenture
Minimum Application	Rs 10,000 (10 NCDs) collectively across all Series and in multiple of Rs 1,000 (1 NCD) thereafter across all Series
Listing	NCDs are proposed to be listed on BSE and NSE
Rating	"[ICRA] AAA (stable) by ICRA Limited ("ICRA"), CARE AAA / Stable by CARE Ratings Ltd. ("CARE") and IND AAA / Stable by India Ratings and Research Private Limited ("India Ratings")
Security and Asset Cover	The principal amount of the Secured NCDs to be issued in terms of this Tranche 2 Prospectus together with all interest due on the NCDs in respect thereof shall be secured by way of exclusive and/or pari passu charge in favour of the Debenture Trustee on specific present and/or future receivables/assets of the Company as may be decided mutually by L&T Finance and the Debenture Trustee. L&T Finance will create appropriate security in favour of the Debenture Trustee for the Secured NCD Holders on the assets adequate to ensure 100% asset cover for the Secured NCDs (along with the interest due thereon).

Bond valuation

- L&T finance bond with coupon rate is 8.7% for 3 years maturity. The credit rating is **AAA**
- What should be the value of the bond?



$$\text{Value of a bond} = \frac{87}{(1+r)^1} + \frac{87}{(1+r)^2} + \frac{1087}{(1+r)^3}$$

- Value of bond=PV of coupon amount + PV of Principal amount

Expected rate of return=Expected return on default-free bond + Default spread

Credit rating…

Rating	**Meanings**
AAA	Highest degree of safety
AA	High degree of safety
A	Adequate degree of safety
BBB	Moderate degree of safety
BB	Moderate risk of default
B	High risk of default
C	Very high risk of default
D	Default or expected to be in default soon

Corporate bond Yield

Ratings								
Year	AAA	AAA	AAA	AAA	AA	AA	AA	AA
	1 years	3 years	5 years	10 years	1 years	3 years	5 years	10 years
2008-09		8.1734	8.5295	8.801				9.0184
2009-10	6.3939	7.1713	8.096	8.5515	6.6913	7.6547	8.4188	8.9509
2010-11	6.7263	6.9401	8.4124	8.8213	7.5435	8.2898	8.8806	9.0062
2011-12	9.6977	9.176	9.4792	9.279	9.67	9.8356	9.6473	9.5096
2012-13	9.3159	9.2599	9.13	9.0732	9.5028	9.3168	9.4743	9.2848
2013-14	9.4453	9.0034	9.1787	8.9266	9.5223	8.9413	9.2013	8.9992
2014-15	8.9918	8.8709	8.7642	8.636	9.2229	9.1595	9.3786	9.2875
2015-16	8.3979	8.2751	8.3878	8.4176	8.8619	8.8827	9.0552	9.2146
2016-17	7.5481	7.5548	7.5499	7.8108	7.9198	8.1983	8.2476	8.6741
2017-18	7.3348	7.4283	7.4036	7.5734	7.5844	7.8598	8.479	8.2198
2018-19	8.2764	**8.4044**	8.5061	8.5589	8.4005	9.1138	9.2557	8.9407

Bond valuation

The Yield of AAA 3-year bond is 8.4044

- Value of a bond $= \frac{87}{(1+8.4044\%)^1} + \frac{87}{(1+8.4044\%)^2} + \frac{1087}{(1+8.4044\%)^3}$

Value of Bond=Rs 1007.563
Current Market price=Rs 1010

1. When the **expected return** on bond is lower than **coupon rate**, then bond is expected to trade at premium (more than par value).
2. When the expected return on bond is higher than coupon rate, then bond is expected to trade at discount (less than par value).
3. When the expected return on bond is equal to coupon rate, then bond is expected to trade at par.

Bond yield

- Bond yields are a measure of the profit you will make from your bond investment.
- Yield-to-maturity (YTM): the return of the bond if you hold it till maturity. The return build-into the pricing of a bond is called **yield-to-maturity**.

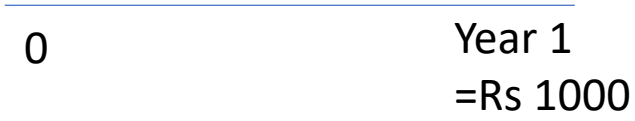
- $\text{Market price} = \frac{C}{(1+YTM)^1} + \frac{C}{(1+YTM)^2} + \frac{C+P}{(1+YTM)^3}$

- $1010 = \frac{87}{(1+YTM)^1} + \frac{87}{(1+YTM)^2} + \frac{1087}{(1+YTM)^3}$
- YTM=8.310%
- I expect 8.40% from the bond, but it is offering 8.310%. Therefore, I will not buy it.

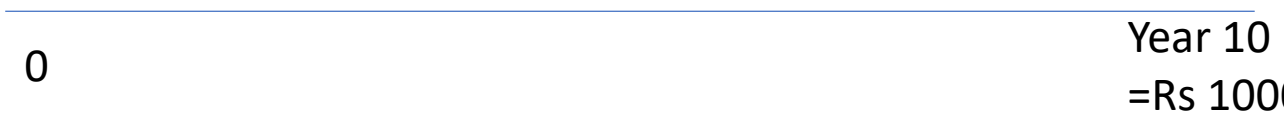
Yield curve

- The relation between yield to maturity and the maturity of bond.

Bond A

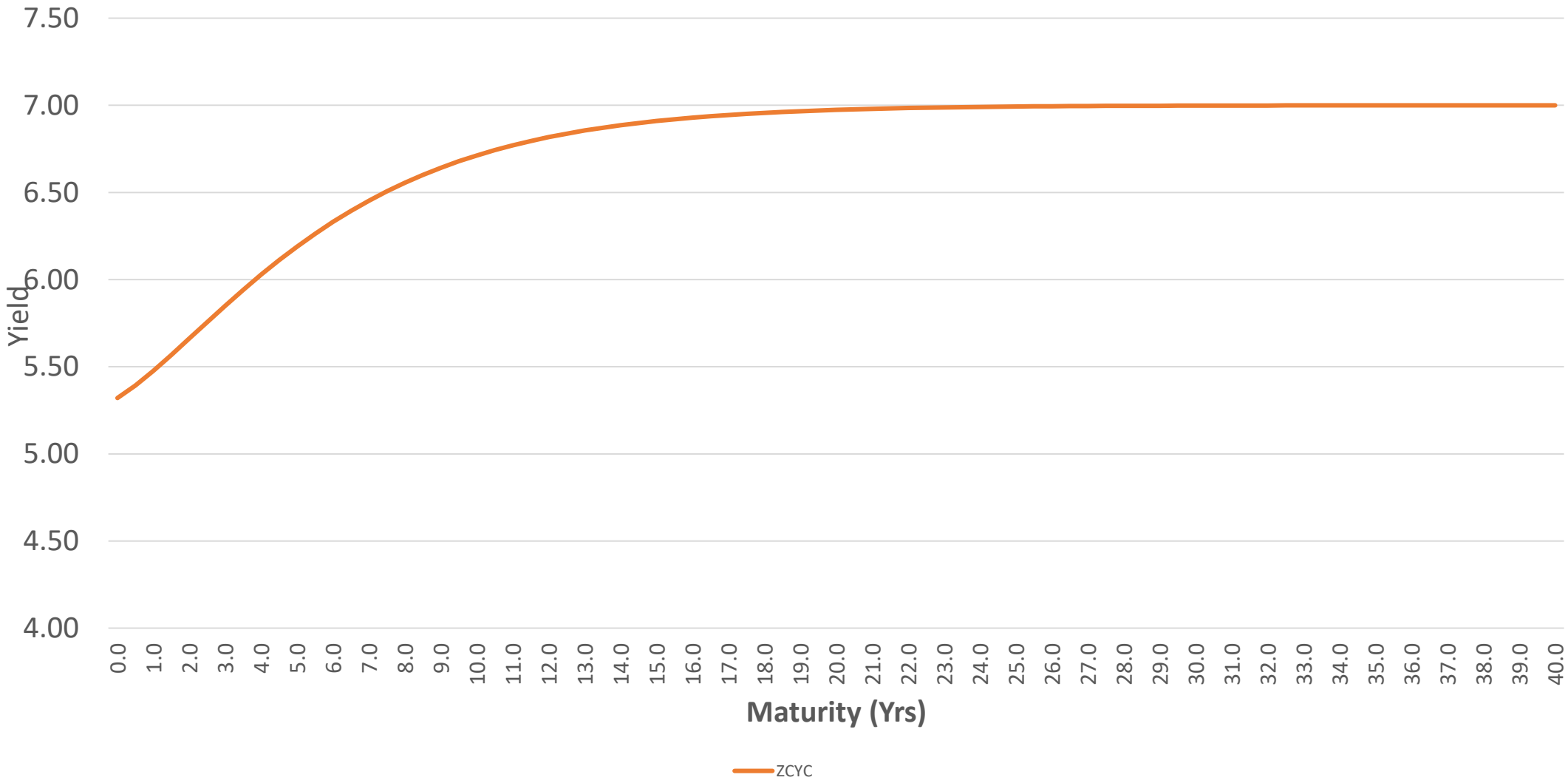


Bond B



Which bond is riskier?

Zero coupon bond yield curve

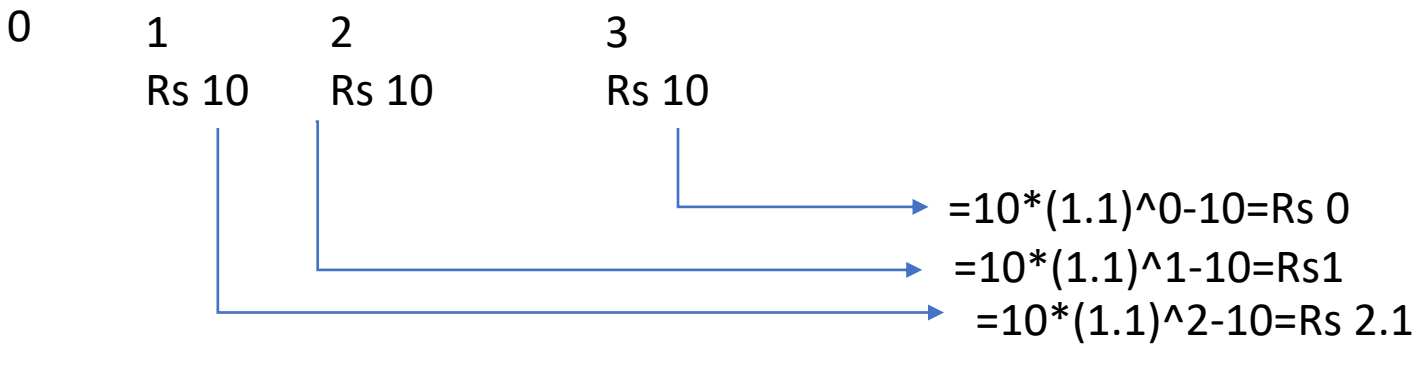


Risk of bonds: Interest-rate risk

- Then uncertainty regarding bond values/prices due to interest rates fluctuations is known as the interest rate risk of bonds
- Two types of interest rate risk: **Price risk** and **coupon reinvestment risk**.
- Assume that you buy zero coupon bond with maturity of 10 years. You paid market price of Rs 500. what is your return (Yield to maturity)
- YTM: $500=\frac{1000}{(1+YTM)\text{^}10}$ = YTM=7.17%
- Now, assume that because of some reason, you have to sell it after 5 years. That time, the market interest rate of similar bond is 8%. What would be expected market price?
- Value of bond after 5 years=1000/ (1.08)^5=Rs 680.58
- Returns (actual yield): 500=680.58/(1+Yield)^5=6.36%
- Since, we sell the bond before maturity and uncertain about the market interest rate at the of selling, thereby we are exposing to **price risk** (uncertainty about the market price)

Risk of bonds: Interest rate risk

- **Coupon reinvestment risk:** when you invest in coupon bond, in order to earn YTM return, you should reinvest all your coupon payments at YTM. If you fail to reinvest, your expected return will be equal to the actual return.
- Assume that bond with coupon rate 10%, par value Rs 100, time to maturity 3 years, and trading at Rs 100. what would be YTM?
- $100 = \frac{10}{(1+YTM)^1} + \frac{10}{(1+YTM)^2} + \frac{110}{(1+YTM)^3}$=YTM=10%
- Interest on coupon amount=



- Total return:
  - Coupon amount= Rs 30
  - Reinvestment amount=Rs 3.1
  - Principal amount=Rs 100
  - Total payment=Rs 133.1
  - Yield: 100=133.1/(1+yield)^3=10%

Risk of bonds: Interest rate risk

	Reinvestment rate		
	5%	10%	15%
Reinvestment payment	Rs. 1.53	Rs. 3.10	Rs. 4.72
Coupon payment	Rs. 30	Rs. 30	Rs. 30
Principal payment	Rs. 100	Rs. 100	Rs. 100
Total return	Rs. 131.53	Rs. 133.10	Rs. 134.73
Investment (Market price)	Rs. 100	Rs. 100	Rs. 100
Yield(%)	9.56%	10.00%	10.45%

https://beta.nseindia.com/market-data/debt-market-reporting-corporate-bonds-traded-on-exchange

Valuation of stock

The choice of financing

- There are only two ways in which a business can raise money.
  - **The first is debt**: The essence of debt is that a debt claim entitles the holder of the claim to a contracted set of cashflows (interest payments and repaying principle). If you fail to make those payments, you lose control of your business.
  - **The second is equity**: With equity, you do get whatever cashflows are left over after you made debt and tax (government) payments.

Debt versus Equity

1. Fixed claim-Coupon and principal payment
2. Tax Deductible
3. High priority in financial trouble
4. Fixed maturity
5. No management control

1. Residual claim-Dividend and selling price
2. Not Tax Deductible
3. Low priority in financial trouble
4. Infinite
5. Management control

Debt
Bank debt
Commercial paper
Corporate Bonds

Hybrid securities
Convertible Debt
Preferred stock
Option-linked bonds

Equity
Owner's equity
Venture capital
Common stock
Warrants

A snap-shot of idea/Entity

Liabilities	**Assets**
Equity	**Real** assets
Debt	

Pricing a stock

- How is a stock priced?
  - Let P_0 be today stock price
  - Let P_1 be the **expected** stock price next year
  - Assume the **expected** dividend at the end of the year Div_t
  - Since a very long-lived assets, let us go one period at a time…

$$P_0 = \frac{DIV_1 + P_1}{(1+r)}$$

  - What is expected P_1?

Pricing a stock

- What is expected P_1?
- $P_1 = \frac{DIV_2 + P_2}{(1+r)}$
- So what is P_0?
- $P_0 = \frac{DIV_1}{(1+r)} + \frac{\frac{DIV_2 + P_2}{(1+r)}}{(1+r)}$
- $P_0 = \frac{DIV_1}{(1+r)} + \frac{DIV_2}{(1+r)^2} + \frac{P_2}{(1+r)^2}$

The stock price (Formula…)

- Continuing this process for n period, we get the following sum

- $P_0 = \frac{DIV_1}{(1+r)} + \frac{DIV_2}{(1+r)^2} + \cdots \ldots + \frac{DIV_n + P_n}{(1+r)^n}$

$$P_0 = \sum_{t=1}^{n} \frac{DIV_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$$

As soon as n is approaching to infinite, the second-term goes to zero. Therefore, the first-term explains the value of stock.

Special case I: Dividend stock

- Suppose dividends expected to remain approximately constant till perpetuity (going-concern), what is the price?
- $P_0 = \frac{DIV}{(1+r)} + \frac{DIV}{(1+r)^2} + \cdots \ldots + \frac{DIV}{(1+r)^{\infty}}$
- $P_0 = \frac{DIV}{r}$

Special case I: Dividend stock (Income stock)

- Suppose ABC firm, utility firm, is expected to be dividend of Rs 10 per share for the foreseeable future and cost of equity is 10%. What should be the value of the stock be ?

- $P_0 = \frac{10}{0.10} = Rs\ 100$

Is forever really forever?

- What if the firm paid the dividends for the next 30 years? What would the price be?
- Value of stock=$10 * \frac{(1+10\%)^{30}-1}{(1+10\%)^{30}*10\%}$=Rs 94.27

Special Case II: Growth stock

- Suppose dividends are expected to grow at a rate of g per year, what is the value of the stock?

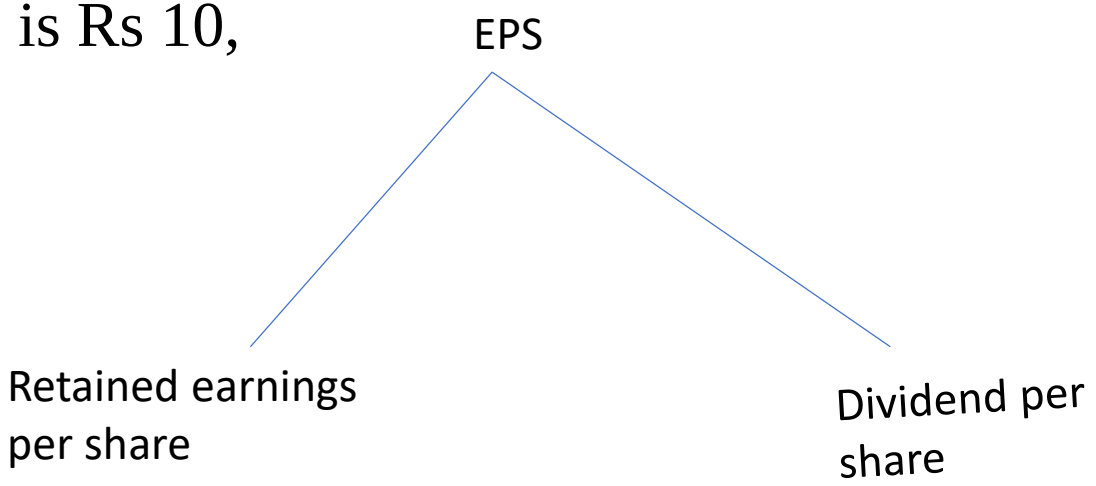
- $P_0 = \frac{DIV}{r-g}$

Special Case II: Growth stock

- Suppose ABC firm is expected to pay dividend of Rs 10 per share and dividends are expected to grow by 5% per year. The cost of equity is 10%. What should be the price of the stock be ?
- $P_0 = \frac{10}{10\% - 5\%} = Rs\ 200$

Engine of growth

- Invested capital per share (ICPS)=$\frac{equity\ Share\ capital}{Number\ of\ outstanding\ stock}$
- Return on investment (ROI)= $\frac{Net\ profit}{Equity\ share\ capital}$
- Earning Per share (EPS)=ROI* ICPS
- Assuming EPS is Rs 10,



Engine of growth (assume perpetuities)

- A firm reports after-tax operating income Rs 75 million on invested capital of Rs 1 billion. It does not plan to reinvest in new asset but will maintain existing assets and its current return on capital. What should be the growth rate?
- If this firm thinks that it can invest 50 million without improving return on capital what growth rate will you see in operating income next year?
- If this firm thinks that it can improve its return on capital on existing assets from 7.5% to 10% next year by making them more efficient, what growth rate will you see in operating income next year?
- If this firm thinks that it can improve its return on capital on existing assets from 7.5% to 10% next year by making them more efficient, along with 50 million new investment. What growth rate will you see in operating income next year?

Engine of growth

Current investment Rs 1000	X	Current ROIC 7.5%	=	Current earnings Rs 75

Current investment Rs 1000	X	Current ROIC 7.5%	+	New investment Rs 50	X	Current ROIC 7.5%	=	Next period earnings Rs 78.75

Current investment Rs 1000	X	Change in Current ROIC 0	+	New investment Rs 50	X	Current ROIC 7.5%	=	Change in next period earnings Rs 3.75

$$\frac{reinvestment\ amount}{Current\ earning} X\ ROIC = \frac{Current\ in\ earnings}{Current\ earnings}$$

$$\frac{50}{75} \quad X \quad 7.5\% = \frac{3.75}{75} = 5\%$$

Good or Bad Growth

- Suppose you know this about Microsoft, Inc.
  - It is expected to earn 10% on its existing assets
  - Has $60 of capital per share
  - Expected return on stock (the cost of equity) is 12%
  - The firm is not planning to grow, what would the value of the stock
  - Return on per stock=10% * $60=$6
  - Value of stock=$\frac{Dividend}{K_e - g} = \frac{6}{0.12} = \$50\ per\ share$

Good or Bad Growth

- Assume, growth rate is 5%
- How much should be reinvesting to grow 5%
- Growth=retained earnings rate * ROE
- 5%=Retained earnings * 10%
- retained earnings rate=$\frac{5\%}{10\%} = 50\%$
- Dividend per share=$6*50%=$3
- Value of stock=$\frac{Dividend\ per\ share*}{K_e - g} = \frac{3}{0.12-0.05} = \$42.85\ per\ share$

Case 1: Good growth-: ROE> Cost of equity

Expected EPS	DPR	Retention ratio	Ke	ROE	Growth rate	Dividend Amount	Equity Value
100	10%	90%	10%	11%	9.90%	10	10000.00
100	20%	80%	10%	11%	8.80%	20	1666.67
100	30%	70%	10%	11%	7.70%	30	1304.35
100	40%	60%	10%	11%	6.60%	40	1176.47
100	50%	50%	10%	11%	5.50%	50	1111.11
100	60%	40%	10%	11%	4.40%	60	1071.43
100	70%	30%	10%	11%	3.30%	70	1044.78
100	80%	20%	10%	11%	2.20%	80	1025.64
100	90%	10%	10%	11%	1.10%	90	1011.24
100	100%	0%	10%	11%	0.00%	100	1000.00

Case 2: Bad growth :- Cost of equity>ROE

Expected EPS	DPR	Retention ratio	Ke	ROE	Growth rate	Dividend Amount	Equity Value
100	10%	90%	10%	9%	8.10%	10	526.32
100	20%	80%	10%	9%	7.20%	20	714.29
100	30%	70%	10%	9%	6.30%	30	810.81
100	40%	60%	10%	9%	5.40%	40	869.57
100	50%	50%	10%	9%	4.50%	50	909.09
100	60%	40%	10%	9%	3.60%	60	937.50
100	70%	30%	10%	9%	2.70%	70	958.90
100	80%	20%	10%	9%	1.80%	80	975.61
100	90%	10%	10%	9%	0.90%	90	989.01
100	100%	0%	10%	9%	0.00%	100	1000.00

Case 3: Who cares:- Cost of equity= ROE

Expected EPS	DPR	Retention ratio	Ke	ROE	Growth rate	Dividend Amount	Equity Value
100	10%	90%	10%	10%	9.00%	10	1000.00
100	20%	80%	10%	10%	8.00%	20	1000.00
100	30%	70%	10%	10%	7.00%	30	1000.00
100	40%	60%	10%	10%	6.00%	40	1000.00
100	50%	50%	10%	10%	5.00%	50	1000.00
100	60%	40%	10%	10%	4.00%	60	1000.00
100	70%	30%	10%	10%	3.00%	70	1000.00
100	80%	20%	10%	10%	2.00%	80	1000.00
100	90%	10%	10%	10%	1.00%	90	1000.00
100	100%	0%	10%	10%	0.00%	100	1000.00

Valuation of HDFC

Bottom-up beta-HDFC Bank

Bank	Beta	Market Cap	Weights
Axis Bank Ltd.	1.17	1731032	14.89%
City Union Bank Ltd.	0.76	143434.4	1.23%
Federal Bank Ltd.	1.3	174684.6	1.50%
I C I C I Bank Ltd.	1.34	2712895	23.34%
IndusInd Bank Ltd.	0.99	979553.3	8.43%
Kotak Mahindra Bank Ltd.	0.8	2927238	25.18%
R B L Bank Ltd.	1.24	165204.5	1.42%
State Bank Of India	1.61	2600186	22.37%
Yes Bank Ltd.	1.3	190451.4	1.64%
Bottom-up beta	1.200		

Dividend History of HDFC Bank

Year	dividend paid	PAT	Loan loss provisions	Reserves and funds	Total capital	Net profit+Provisions	equity capital	ROE	Dividend payout
2009	-4263.2	29487	22,887.40	210647.5	4577.4	52,374.40	215224.9	0.24	0.14
2010	-5519.4	39264	11,985.50	249140.4	4652.3	51,249.50	253792.7	0.20	0.14
2011	-7695.5	51670.9	10,917.70	294553.5	4693.4	62,588.60	299246.9	0.21	0.15
2012	-10130.6	67262.8	12,342.10	357382.7	4758.8	79,604.90	362141.5	0.22	0.15
2013	-13134.9	84783.8	16,325.80	429988.2	4798.1	101,109.60	434786.3	0.23	0.15
2014	-16492.8	102159.2	17,235.80	615081.2	5013	119,395.00	620094.2	0.19	0.16
2015	-20091.6	122962.1	21,336.30	721721.4	5056.4	144,298.40	726777.8	0.20	0.16
2016	-24083.1	145496.4	31,453.00	889498.5	5125.1	176,949.40	894623.6	0.20	0.17
2017	-28312.7	174867.3	49,104.30	1057759.9	5190.2	223,971.60	1062950.1	0.21	0.16
2018	-33842.9	210781.7	63,941.10	1486616.9	5446.6	274,722.80	1492064	0.18	0.16
						Average		0.21	0.16

DDM-HDFC Bank

- Cost of equity=6.68+4.77*1.20+1.41=13.81%
- Implied growth rate=(1-dividend payout ratio)* ROE=(1-0.16)*21%=17.66%
- Implied dividend payout ratio=(1-(growth/ROE))
- Current year ROE + Loan loss provisions=Rs 274,722.80 million

DDM-HDFC

	High growth period			Transition period									
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Net Profit	274723	323238	380321	443681	513161	588389	668761	753424	841271	930949	1020876	1109281	1194248
Growth rate	17.66%	17.66%	17.66%	16.66%	15.66%	14.66%	13.66%	12.66%	11.66%	10.66%	9.66%	8.66%	7.66%
ROE	20.91%	20.91%	20.91%	20.91%	20.91%	20.91%	20.91%	20.91%	20.91%	20.91%	20.91%	20.91%	20.91%
Dividend payout ratio	15.52%	15.52%	15.52%	20.31%	25.09%	29.88%	34.66%	39.44%	44.23%	49.01%	53.79%	58.58%	63.36%
Dividend amount	42649	50181	59043	90103	128760	175781	231783	297166	372057	456249	549155	649773	756671
Cost of equity	13.81%	13.81%	13.81%	13.81%	13.81%	13.81%	13.81%	13.81%	13.81%	13.81%	13.81%	13.81%	13.81%
Present value	37473	44091	45581	61117	76739	92048	106643	120132	132153	142390	150584	156551	160180

$$Terminal\ value = \frac{756671\ *(1+6.68\%)}{(13.81\%-6.68\%)} X \frac{1}{(1{,}1381)\text{^}13} = \text{Rs } 2429470 \text{ million}$$

Value of equity (March 2019)= 1325682 + 2429470 = Rs 3755152 million

Value of equity today= 3755152*(1.1381)^(5/12)= 3963151

Value of options= Rs 5359

Value of equity=3963151-5359=3957792

Outstanding shares= 2680.00 million : Value per share= 3957792 / 2680.00 = Rs. 1401.18

The cost of equity: A recap

bottom-up betas

Historical Premium
1. Mature equity market premium stocks over T bonds
2. Country risk premium

$$Cost\ of\ equity = Riskfree\ rate + Beta * Risk\ premium$$

Must be in the same currency as cash flows and defined in same terms (real or nominal) as the cash flows

Cost of debt

What is debt?

- 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.
- Therefore, 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.
  - Cost of debt (pretax)=Risk-free rate + firm's default spread + country's default spread.
- If the firm is not rated,
  - 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.

Rating-wise yield..

Ratings								
Year	AAA	AAA	AAA	AAA	AA	AA	AA	AA
	1 years	3 years	5 years	10 years	1 years	3 years	5 years	10 years
2008-09		8.1734	8.5295	8.801				9.0184
2009-10	6.3939	7.1713	8.096	8.5515	6.6913	7.6547	8.4188	8.9509
2010-11	6.7263	6.9401	8.4124	8.8213	7.5435	8.2898	8.8806	9.0062
2011-12	9.6977	9.176	9.4792	9.279	9.67	9.8356	9.6473	9.5096
2012-13	9.3159	9.2599	9.13	9.0732	9.5028	9.3168	9.4743	9.2848
2013-14	9.4453	9.0034	9.1787	8.9266	9.5223	8.9413	9.2013	8.9992
2014-15	8.9918	8.8709	8.7642	8.636	9.2229	9.1595	9.3786	9.2875
2015-16	8.3979	8.2751	8.3878	8.4176	8.8619	8.8827	9.0552	9.2146
2016-17	7.5481	7.5548	7.5499	7.8108	7.9198	8.1983	8.2476	8.6741
2017-18	7.3348	7.4283	7.4036	7.5734	7.5844	7.8598	8.479	8.2198
2018-19	8.2764	**8.4044**	8.5061	8.5589	8.4005	9.1138	9.2557	8.9407

CRISIL default (%)

Rating category	Three-year
AAA	0.00%
AA	0.20%
A	1.90%
BBB	3.89%
BB	11.17%
B	20.99%
C	39.01%

How to measure default rate?

- $Alman\ Z\ score = 1.2 * \left(\frac{Working\ capital}{Total\ assets}\right) + 1.4 * \left(\frac{Retainted\ earnings}{total\ assets}\right) + 3.3 * \left(\frac{EBIT}{Total\ assets}\right) + 0.6 * \left(\frac{Equity\ value}{total\ liabilities}\right) + 0.999 * (\frac{Total\ sales}{Total\ assets})$
- In this model, if the Z value is greater than 2.99, then the firm is said to be in the “safe zone” and has a negligible probability of filing bankruptcy.
- If the Z value is between 2.99 and 1.81, then the firm is said to be in the “grey zone” and has a moderate probability for bankruptcy.
- And finally, if the Z value is below 1.81, then it is said to be in the “distress zone” and has a very high probability of reaching the stage of bankruptcy.

Altman z score for emerging market firms

- $Alman\ Z\ score$=6.56*(($Working\ capital$)/($Total\ assets$) + 3.26∗(($Retainted\ earnings$)/($total\ assets$)) + 6.72∗($EBIT$/($Total\ assets$)) + 0.6∗(($Equity\ value$)/(total liabilities)) + 1.05∗(($Total\ sales$)/($Total\ assets$))
- In this model, if the Z value is greater than 2.6, then the firm is said to be in the “safe zone” and has a negligible probability of filing bankruptcy.
- If the Z value is between 2.6 and 1.1, then the firm is said to be in the “grey zone” and has a moderate probability for bankruptcy.
- And finally, if the Z value is below 1.1, then it is said to be in the “distress zone” and has a very high probability of reaching the stage of bankruptcy.

Default rate (TCS) in 2019

	(in crores)			Weight
Current Liabilities	14789	Working capital to total assets	0.448	6.56
Current assets	50752	Retained earning to total assets	0.978	3.26
Working capital	35963	EBIT/TA	0.546	6.72
Total assets	80265	Equity value/total liabilities	620.241	0.6
$Retainted\ earnings$	78523	Sales/TA	1.825	1.05
EBIT	43817			
Sales	146463			
Equity value(market cap)	847870			
total liabilities	1367	Altman z score	383.86	
		Probability of default	0.00	

Cost of debt (TCS)

- Default rate=0.00
- Expected Rating =AAA
- ICRA Rating =AAA
- Cost of debt (Pre-tax)=8.5589%

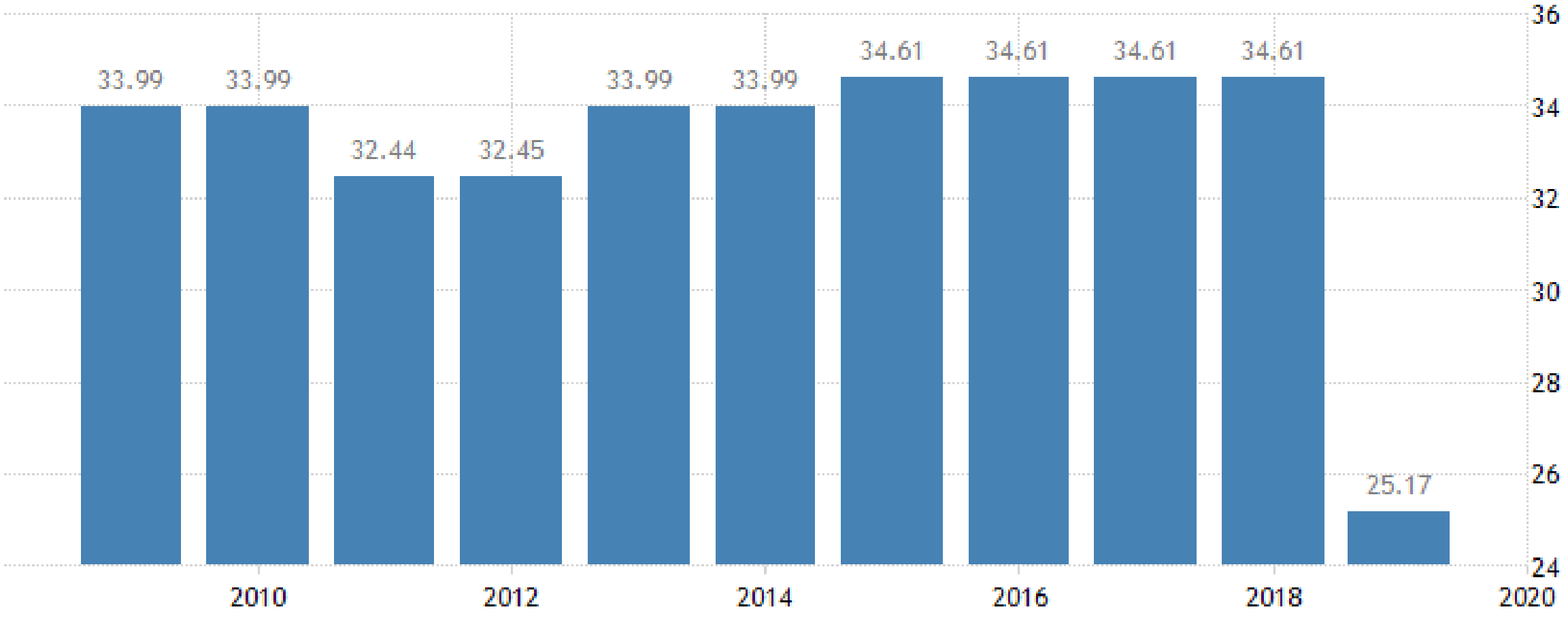
Subsidized Debt: What should we do?

- Assume that Indian govt. lends money to XYZ firm at subsidized interest rate (say 5%). In computing the cost of capital to value XYZ firm. What should we use from the following?
  - The subsidized cost of debt (5%). That is what the firm is paying.
  - The fair cost of debt (9%). That is what the firm should require its project to cover.
  - A number in the middle.

Cost of debt (tax advantage)

- Almost all countries (perhaps middle east), firms borrow money and they pay interest before tax payment. Therefore, they receive tax advantage.
- We generally use cost of debt (pre-tax) and multiple by (1-tax rate) to estimate cost of debt (post-tax). However, we get tax advantage if a firm's operating income is more than interest amount.
- Would you use cost of debt (post-tax) or cost of debt (pre-tax) for One97 Communications Limited (Paytm), given the firm has negative earnings?

Tax Rate in India



SOURCE: TRADINGECONOMICS.COM | MINISTRY OF FINANCE, GOVERNMENT OF INDIA

Weights for the cost of capital computation

- In computing the cost of capital for a publicly traded firm, the general rule for computing weights for debt and equity is that you use market value weights (and not book value weights). Why?
  - Because the market is often right.
  - Because market values are easy to obtain.
  - Because book values of debt and equity are meaningless.
  - None of the above.

Cost of capital of RIL

- Cost of equity=6.68% + 4.77%*1.07 + 1.47%=13.25%
- Cost of Debt=8.35%
- Market value of equity=Rs. 8024906 million
- Vale of debt=Rs 91,4269.9 million
- Tax rate(Should be marginal tax rate)=34.61%
- Cost of capital =13.25% ∗ (8024906/ (914269.9 + 8024906) + 9.18%*(91 4269.9 /(91 4269.9 + 8024906)=12.83%

Corporate Finance: The Big Picture

Maximize the value of the business (firm)

The Investment Decision
Invest in assets that earn a return greater than the minimum acceptable hurdle rate

The hurdle rate should reflect the riskiness of the investment and the mix of debt and equity used to fund it.

The **return** should reflect the magnitude and the timing of the cashflows as well as all side effects

The Financing Decision
Find the right kind of debt for your firm and the right mix of debt and equity to fund your operations

The **optimal mix** of debt and equity maximizes firm value. The **right kind of debt** matches the tenor of your assets

The Dividend Decision
If you cannot find investments that make your minimum acceptable rate, return the cash to owners of your business

How you choose to return cash to the owners will depend on whether they prefer dividends or buybacks

Debt versus Equity

1. Fixed claim
2. Tax Deductible
3. High priority in financial trouble
4. Fixed maturity
5. No management control (why?)

1. Residual claim
2. Not Tax Deductible
3. Low priority in financial trouble
4. Infinite
5. Management control (why?)

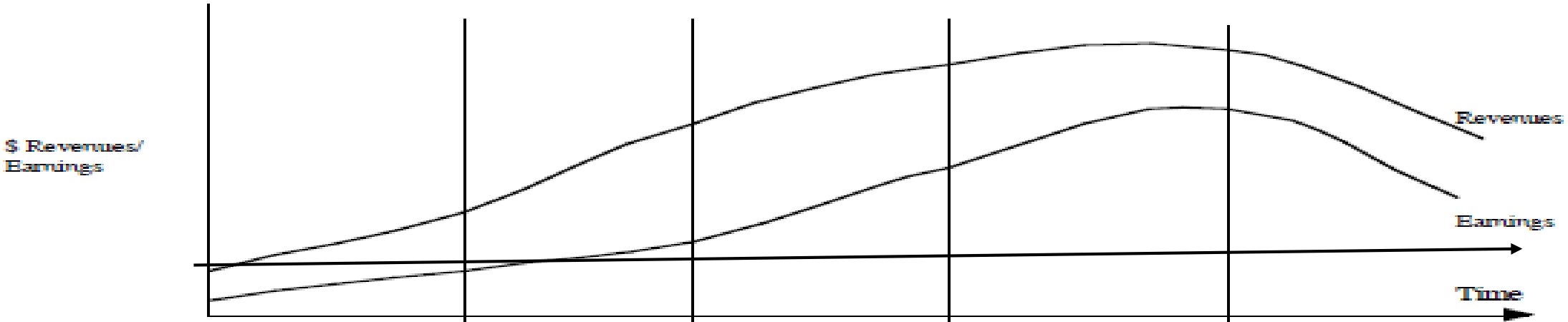
Debt
Bank debt
Commercial paper
Corporate Bonds

Hybrid securities
Convertible Debt
Preferred stock
Option-linked bonds

Equity
Owner's equity
Venture capital
Common stock
Warrants

The corporate life cycle

Financing Choices across the life cycle



External funding needs	High, but constrained by infrastructure	High, relative to firm value.	Moderate, relative to firm value.	Declining, as a percent of firm value	Low, as projects dry up.
Internal financing	Negative or low	Negative or low	Low, relative to funding needs	High, relative to funding needs	More than funding needs
External Financing	Owner`s Equity Bank Debt	Venture Capital Common Stock	Common stock Warrants Convertibles	Debt	Retire debt Repurchase stock
Growth stage	Stage 1 Start-up	Stage 2 Rapid Expansion	Stage 3 High Growth	Stage 4 Mature Growth	Stage 5 Decline
Financing Transitions	Accessing private equity	Inital Public offering	Seasoned equity issue	Bond issues	

Financing pattern of Indian firms

Panel A: Large enterprises (LEs)									
	All LEs	LE-M	LE-S	Listed LEs	Unlisted LEs	Listed LE-M	Unlisted LE-M	Listed LE-S	Unlisted LE-S
Internal sources	46.6	47.8	43.9	58.3	34.51	60.67	28.02	46.74	42.77
Equity (private + public)	16.8	15.6	19.5	12.4	21.28	12.00	21.11	14.46	21.5
Capital market-debt	2.5	1.9	3.8	2.2	2.76	2.2	1.5	2.2	4.37
Debt: banks and FI's	16.9	16.3	18.4	12.3	21.64	11.16	24.17	18.34	18.43
Debt: group Co's/ promoters	1.9	2.2	1.2	−0.2	4.11	−0.2	5.93	−0.2	1.79
Trade credits	11.2	11.7	10.0	12.0	10.35	11.68	11.85	13.83	8.44
Other sources	4.1	4.4	3.2	2.8	5.35	2.49	7.42	4.63	2.72
Median assets value (in Rs. crores)	70.37	70.55	69.76	223.16	51.19	232.24	50.73	181.76	54.62
Number of Obs.	4760	3899	861	1001	3759	837	3062	164	697
Panel B: Small and medium enterprises (SMEs)									
	All SMEs	SME-M	SME-S	Listed SMEs	Unlisted SMEs	Listed SME-M	Unlisted SME-M	Listed SME-S	Unlisted SME-S
Internal sources	15.11	11.04	21.45	39.49	11.16	26.99	8.47	58.69	15.35
Equity (private + public)	31.59	33.44	28.7	34.82	31.06	28.68	34.21	44.25	26.16
Capital market-debt	6.99	9.71	2.8	3.4	7.57	5.33	10.41	0.45	3.15
Debt: banks and FI's	21.62	24.61	17.0	10.44	23.44	17.71	25.72	−0.71	19.88
Debt: group Co's/ promoters	3.4	4.29	2.0	8.98	2.49	12.64	2.95	3.36	1.78
Trade credits	15.83	14.11	18.51	6.89	17.28	9.4	14.87	3.03	21.04
Other Sources	5.5	2.81	9.6	−4.03	7.00	−0.74	3.38	−9.1	12.65
Median assets value (in Rs. crores)	9.55	10.82	6.36	69.56	8.64	64.97	9.93	85.38	5.77
Number of Obs.	9014	6121	2893	400	8614	282	5839	118	2775

Measuring a firm’s financing mix

- My firm is having Rs 10 million debt. Is it high or low
- The simplest measure of how much debt and equity a firm is using currently is to look at proportion of debt in the total financing: This ratio is called the debt to capital ratio:
  - Debt to Capital ratio=Debt/(debt+capital)
- Debt includes all interest-bearing liabilities, short-term as well long-term. It should also include other commitments that meet the criteria for debt: contractually pre-set payments that must be made, no matter what the firm’s financial standing.
- Equity can be defined either accounting terms (book value of equity) or in market value terms (based on the current price). The resulting debt ratios can be very different.

The financing mix question

- In deciding to raise financing for a business, is there an optimal mix of debt and equity?
  - If yes, what is the trade off that lets us determine this optimal mix?
  - What are the costs of using debt instead of equity?

The illusory benefits of debt

- At first sight, the benefit of debt seems obvious. The cost of debt is lower than the cost of equity.
- The benefit is an illusion , though, because debt is cheaper than equity for a simple reason. The lender gets both first claim on cashflows and a contractually pre-set cashflows. The equity investor is last in line and should demand a higher rate of return than the lender does.
- Equity holders face not only business risk (uncertainty about the business), also financial risk (uncertainty about fixed claim payment).
- By borrowing money at a lower rate, you are not making a business more valuable, but moving the risk around, since more borrowing makes existing equity and debt riskier.

Costs and benefits of debt

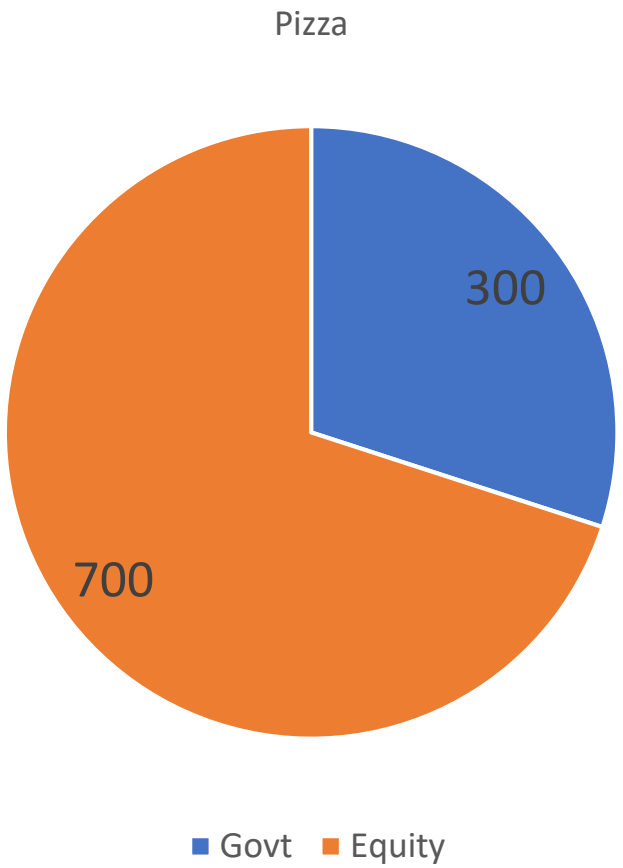
Advantages of Borrowing	Disadvantages of Borrowing
Tax Benefit: Higher tax rates --> Higher tax benefit	Bankruptcy Cost: Higher business risk --> Higher Cost
Added Discipline: Greater the separation between managers and stockholders --> Greater the benefit	Agency Cost: Greater the separation between stockholders & lenders --> Higher Cost
	Loss of Future Financing Flexibility: Greater the uncertainty about future financing needs --> Higher Cost

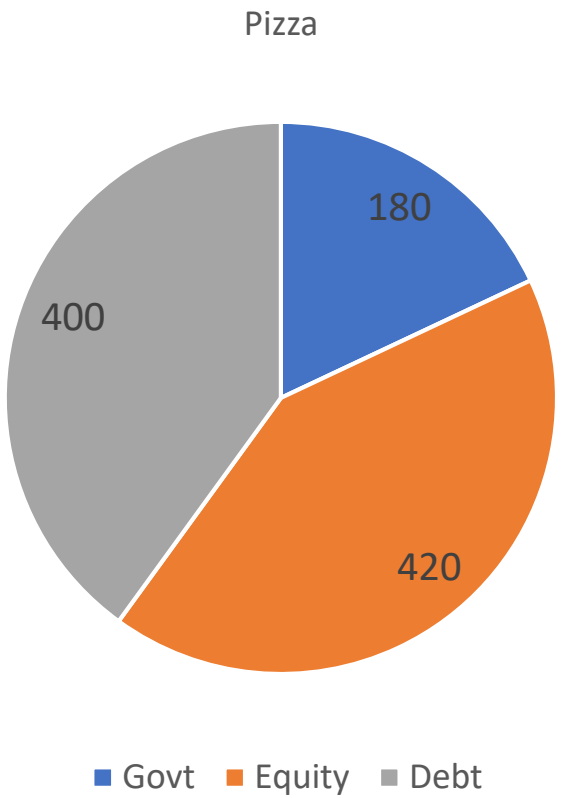
Costs and benefits of debt

- **Benefits of debt**
  - **Tax benefits:** The tax code is tilted in favor of debt, with interest payments being tax deductible in most parts of the world, while cashflows to equity are not

	Firm A	Firm B
Total investment	10,000	10,000
ROI	10%	10%
Debt @8%	0	5000
Equity	10000	5000
EBIT	1000	1000
Less Interest	0	400
EBT	1000	600
Less Tax @30%	300	180
PAT	700	420

A pizza size cannot be changed, but I can reduce the share of my brother by borrowing





	Firm A	Firm B	Difference
Return on equity (PAT/equity investments)	700/10000=7.00%	420/5000=8.40%	1.4%
Return on assets (EBIT*(1-t))/Total investments	(1000*(1-.30))/10000=7%	1000*(1-.30))/10000=7%	0%

ROE=ROA+(ROA-Interest rate*(1-t))*D/E

$$8.4\% = 7\% + \left(7\% - 8\% * (1 - 30\%)\right) * \frac{5000}{5000}$$

Operating decisions

Financing decisions (Financial leverage)

Tax benefits of debt

- When you borrow money, you can deduct interest expenses from your income to arrive at taxable income. This reduces your taxes. When you use equity, you are not allowed to deduct payments to equity (such as dividends) to arrive at taxable income
- The dollar tax benefits from the interest payment in any year is a function of your tax rate and the interest payment:
  - Tax benefit each year=Tax rate*Interest payments

The caveat is that you need to have the income to cover interest payments to get this tax benefit.

- Proposition 1: *Other things being equal, the higher the marginal tax rate of a business, the more debt it will have in its capital structure*.

Debt adds discipline to management (Monitoring)

- If you are manager of a firm with no debt, and you generate high income and cashflows each year, you tend to become self-satisfied. The satisfaction can lead to inefficiency and investing in poor projects. There is little or no cost born by the managers.
- Forcing such a firm to borrow money can be an antidote to the satisfaction. The managers now have to ensure that the investments they make will earn at least enough return to cover interest expenses. The cost of not doing so is liquidation and loss of such a job.

Debt and discipline

Assume that you into this argument that debt adds discipline to management. Which of the following types of firms will most benefit from debt adding this discipline?

1. Conservatively financed (very little debt), privately owned firms.
2. Conservatively financed, publicly traded firms, with stocks held millions of investors, none of whom hold a large percent of the stock.
3. Conservatively financed, publicly traded firms, with an activist and primarily institutional holding.

Bankruptcy cost

- The expected bankruptcy cost is a function of two variables:
  - The probability of bankruptcy, which will depend on how uncertain you are about future cashflows.
    - The size of operating cashflows relative to size of cashflows on debt obligations.
    - Variance in operating cashflows (business risk; the sensitivity of the demand of the firm's products with the economic condition)
  - The cost of going bankrupt
    - Direct costs: the outflows of cash during bankruptcy, such as legal and admin costs, at the time of bankruptcy. The bankruptcy cost of Leman brother is $2 billion
    - Indirect costs: Costs arising because people perceive you to be in financial trouble.

On Oct 1, 2008, A strong rumor that ICICI Bank has gone bankrupt sent several depositors rushing for ATMs to withdraw money. The ICICI Bank stock is down 37.47% from its recent high of Rs 551.45 on 1 October 2008.

Bankruptcy cost

- Proposition 2: *firms with more volatile earnings and cashflows should use debt less than otherwise similar firms with stable cashflows.*
- Proposition 3: *Other things being equal, the greater the indirect bankruptcy cost, the less debt the firm can afford to use for any given level of debt.*
- In Indian system, business groups operate multiple independent firms, where one firm provide insurance to another firms. What are the implications of this structure on financing mix?

Bankruptcy cost

- Firms with following products are likely to have greater bankruptcy (indirect) costs
  - Firms that sell durable products with long lives that require replacement parts and service: Tata motor would have greater indirect costs associated with bankruptcy than Avenue supermarts.
  - Firms that provide goods or service for which quality is an important attribute that is difficult to determine in advance: Manipal Hospitals would have more indirect costs associated with bankruptcy than Jubilant Foodworks.
  - Firms that provide service after sale:

Debt & Bankruptcy cost

- Rank the following firms on the magnitude of bankruptcy (indirect) costs from the most to least, considering both explicit and implicit costs:

a. A Grocery store

b. An Airplane Manufacture

c. High Technology firm

Agency cost

- An agency cost arises whenever you hire someone else to do something for you. It arises because your interests(as the principal) may deviate from those of the person you hired (as the agent).
- When you lend money to a business, you are allowing stockholders to use that money in the course of running that business. Stockholders interests are different from your interests, because
  - You (as lender) are interested in getting your money back.
  - Stockholders are interested in maximizing their wealth
- In some cases, the clash of interests can lead to stockholders..
  - Investing in riskier projects than you would want them to
  - Paying themselves large dividends when you would rather have kept the cash in the business.

Selfish Investment Strategy 1

The value of outstanding bond=Rs. 100					
Value of firm if low-risk project is chosen					
	Probability	Value of firm		Stock	Bond
Recession	0.5	100	=	0	100
Boom	0.5	200	=	100	100
	Expected value=0.5*100+200*.5=150 Expected value of bond=100*0.5+100*0.5=$100 Expected value of stock=$150-$100=$50				
Value of firm if high-risk project is chosen					
Recession	0.5	50	=	0	50
Boom	0.5	240	=	140	100
	Expected value=0.5*50+240*.5=145 Expected value of bond=50*0.5+100*0.5=75 Expected value of stock=$145-$75=$70				

Selfish Investment Strategy 2

Consider a firm with Rs 4000 of principle and investment payments due at the end of the year. The firm is also having a positive NPV project with value of Rs 1700, after investment of Rs 1000 (possible equity investment).

	Firm without project		Firm with project	
	Boom	Recession	Boom	Recession
Firm cashflow	5000	2400	6700	4100
Bondholders' claim	4000	4000	4000	4000
Stockholders' claim	1000	0	2700	100

Debt and Agency Costs

- Assume that you are a bank. Which of the following businesses would you perceive the greatest agency costs?
  - A Large Technology firm
  - A Large Regulated Electric Utility
  - A Real Estate corporation

Can debtholders reduce agency problem?

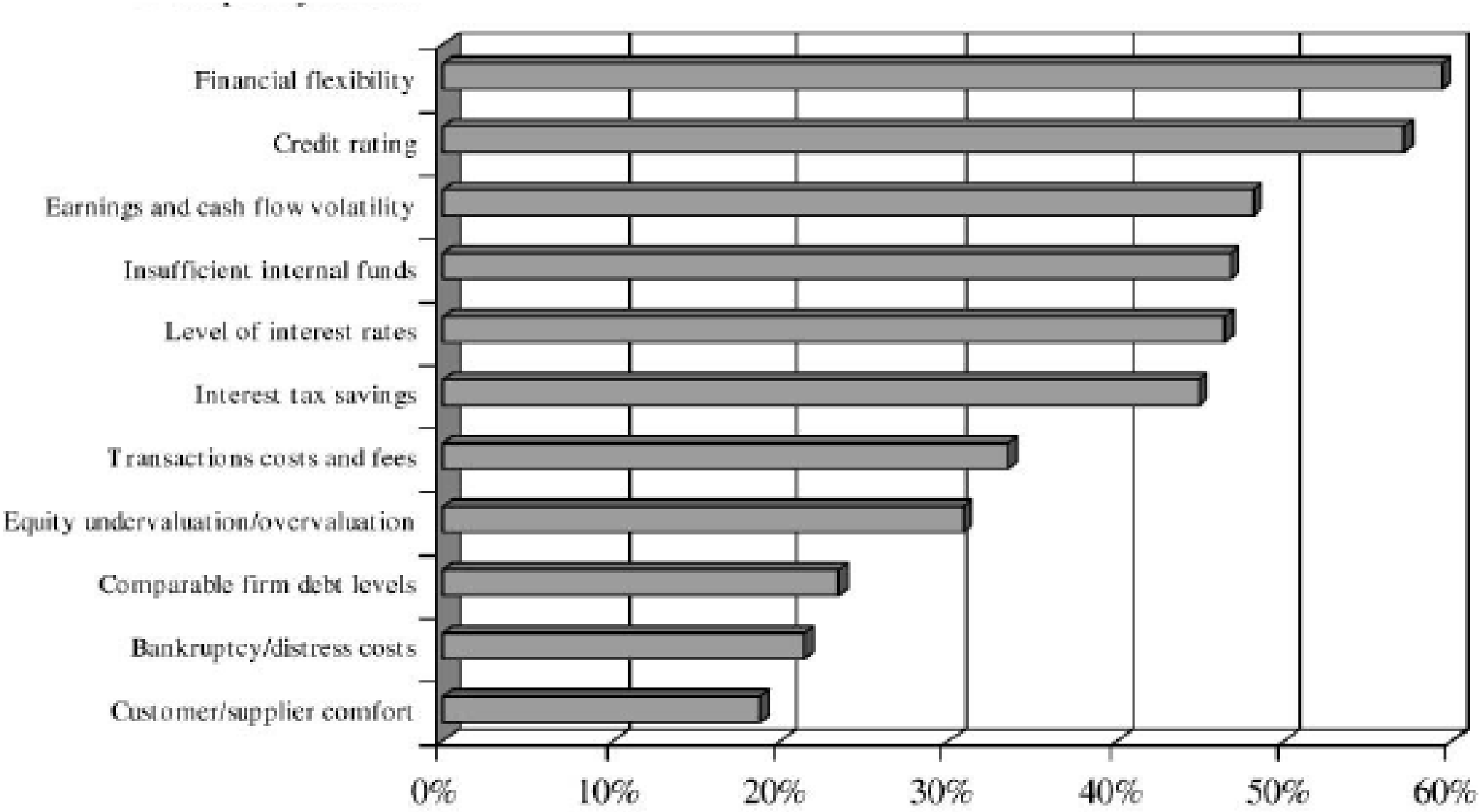
- In order to protect the interest of borrowers, the monitoring (covenants) is incorporated as part of loan document.
- Typically, the monitoring cost of borrowers is higher for firms whose investments cannot be easily observed and monitored. For instance, service firms.
- The monitoring cost is also high for firms whose projects are long-term, follow unpredictable paths. For instance, Pharma firms.

Proposition 4: *Other things being equal, the greater the agency problems associated with lending to a firm, the less debt the firm can afforded to use.*

Loss of future financing flexibility

- When a firm borrows up to its capacity, it loses the flexibility of financing future projects with debt.
- Thus, if the firm is faced with an unexpected investment opportunity or a business shortfall, it will not be able to draw on debt capacity, if it has already used it up.
- Proposition 5: *Other things remaining equal, the more uncertain a firm is about its future financing requirements and projects, the less debt the firm will use for financing current projects.*

Debt policy factors



Application Test: Would you expect your firm to gain or lose from using a lot of debt?

- Considering, for your firm,
  - The potential tax benefits of borrowing
  - The benefits of using debt as a disciplinary mechanism
  - The potential for expected bankruptcy costs
  - The potential for agency costs
  - The need for financial flexibility
- Would you expect your firm to have a high debt ratio or a low debt ratio?
- Does the firm’s current debt ratio meet your expectations?

The trade off for Dr. Reddy'S Laboratories Ltd, Bajaj Auto Ltd., and Hindustan Unilever Ltd.

Debt trade-off	**Discussion of relative benefits/costs**
Tax benefits	Margin tax rate is same for all firms, but there is an offsetting tax benefit for Dr. Reddy , such as Depreciation relative to operating profit.
Added discipline	The benefits would be higher for Dr. Reddy where there is a clear separation of ownership and management (promoter holding =27%).
Expected Bankruptcy costs	Volatility in earnings is higher at Bajaj auto (cyclicality), and Dr Reddy and lower at HUL. Indirect bankruptcy cost likely to be highest at Dr. Reddy, since its products have impact on Human life. Bajaj auto would be at the second place because its products (automobiles) have long lives and require service.
Agency cost	Highest at Dr. Reddy because its assets are intangible and therefore, difficult to monitor. Bajaj Auto is highly visible and easily monitored. Moreover, because of part of family group.
Flexibility needs	Dr. Reddy will value flexibility more than other firms, because Pharma is an unpredictable business, where future investment needs are difficult to forecast. The flexibility needs should be lower at HUL because it is matured firm and well-established investment needs

A firm in a heaven

- Assume that you live in a heaven where

a. There are no taxes

b. Managers have stockholders' interests at heart and do what's best for stockholders

c. No firm ever goes bankrupt

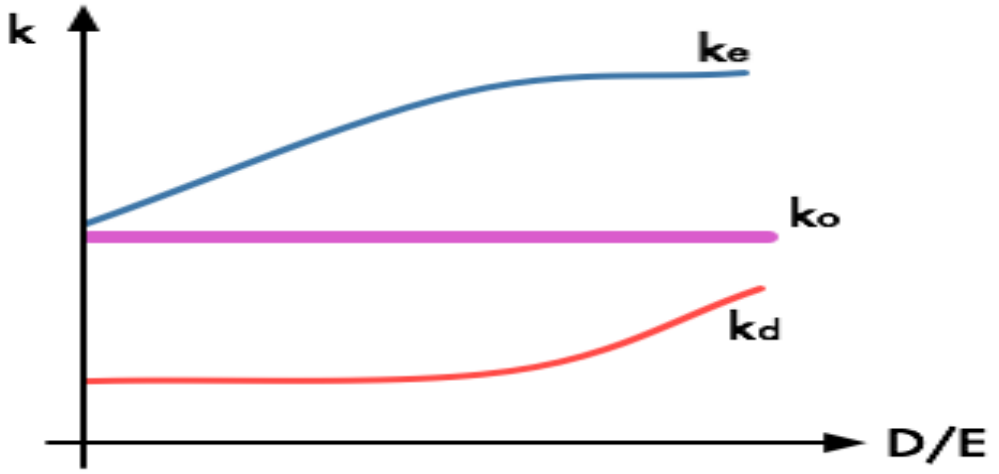
d. Equity investors are honest with lenders, there is no subterfuge or attempt to find loopholes in loan agreements

e. Firms know their future financing needs with certainty

❑What happens to trade off between debt and equity? How much should you borrow for this firm?

The Miller-Modigliani Theorem

- In an environment, where there are no taxes, default risk or agency costs, capital structure is irrelevant.
- If the Miller Modigliani theorem holds:
  - A firm's value will be determined the quality of its investments and not by its financing mix.
  - 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.



What do firms look at in financing?

- There are some who argue that firms follow a financing hierarchy, with retained earnings being the most preferred choice for financing, followed by debt and that new equity is the least preferred choice. In particular
  - **Managers value flexibility.** Managers value being able to use capital (on new investments or assets) without restrictions on that use or having to explain its use to others.
  - **Managers value control.** Managers like being able to maintain control of their businesses.
- With flexibility and control being key factors:
  - Would you rather use internal financing (retained earnings) or external financing?
  - With external financing, would you rather use debt or equity?

Preference rankings long-term finance: Results of a survey

Ranking	Source	Score
1	Retained Earnings	5.61
2	Straight Debt	4.88
3	Convertible Debt	3.02
4	External Common Equity	2.42
5	Straight Preferred Stock	2.22
6	Convertible Preferred	1.72

Financing choice

- You are reading business news paper and notice a firm, offering to sell convertible preferred stock. What would you hypothesize about the health of the firm issuing these securities?
  - Nothing
  - Healthier than the average firm
  - In much more financial trouble than the average firm

CAPITAL STRUCTURE: FINDING THE RIGHT FINANCING MIX

The cost of capital approach

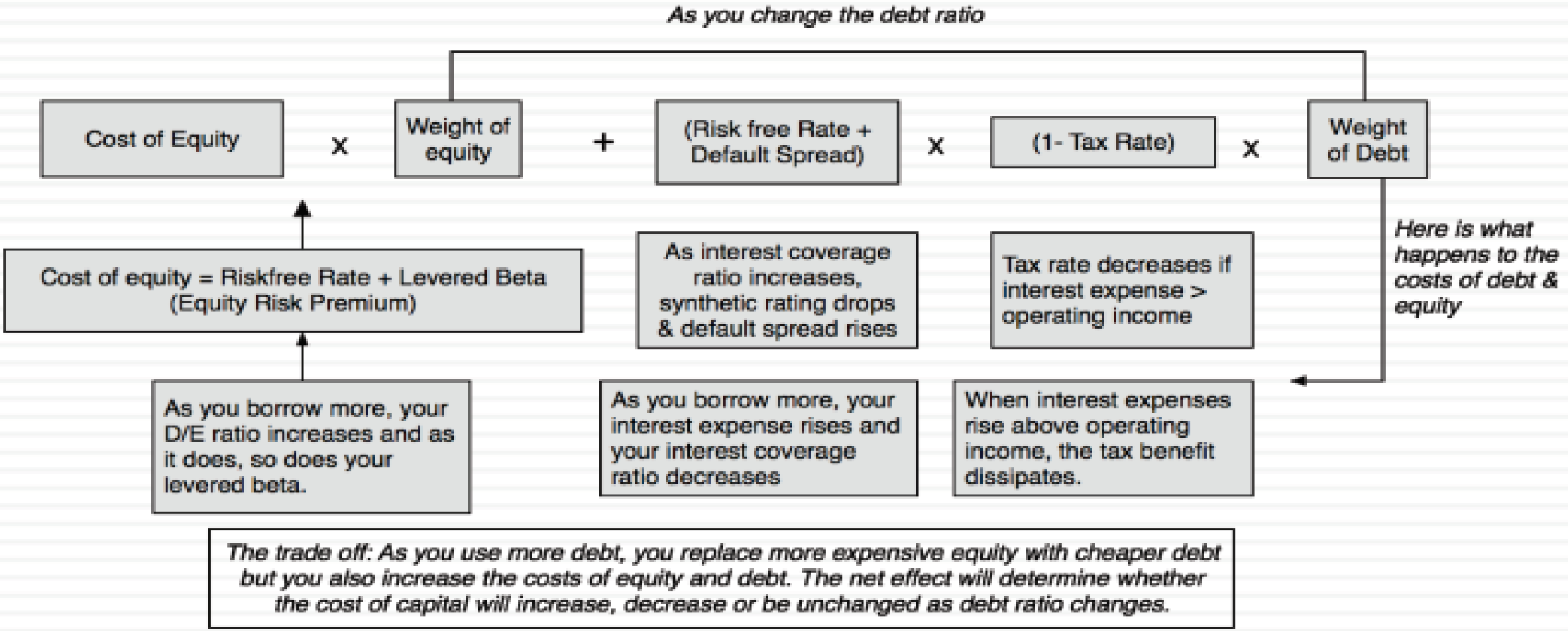
- Value of firm=present value of cashflows to the firm, discounted back at the cost of capital.
- If the cashflows to the firm are held constant, and cost of capital is minimized, the value of firm will be maximized.
- Cost of capital=cost of equity (E/(D+E)) +Pretax cost of debt *(1-t) *(D/(D+E)).
- Now, as debt ratio changes, how does the cost of capital change?

Synthetic credit ratings (Interested coverage ratio)

http://pages.stern.nyu.edu/~adamodar/
New_Home_Page/datafile/ratings.htm

Greater Than	≤ to	Rating is	Spread is
-100000	0.199999	D2/D	18.60%
0.2	0.649999	C2/C	13.95%
0.65	0.799999	Ca2/CC	10.63%
0.8	1.249999	Caa/CCC	8.64%
1.25	1.499999	B3/B-	4.37%
1.5	1.749999	B2/B	3.57%
1.75	1.999999	B1/B+	2.98%
2	2.2499999	Ba2/BB	2.38%
2.25	2.49999	Ba1/BB+	1.98%
2.5	2.999999	Baa2/BBB	1.27%
3	4.249999	A3/A-	1.13%
4.25	5.499999	A2/A	0.99%
5.5	6.499999	A1/A+	0.90%
6.5	8.499999	Aa2/AA	0.72%
8.50	100000	Aaa/AAA	0.54%

The debt trade off on the cost of capital



Estimating the cost of debt

- The cost of debt is the rate at which you can borrow money long-term at currently, it will reflect not only your default risk, but also the level of interest rate in the market, including country-level risk.

Cost of debt (Pre-tax)=Risk-free rate +firm default spread + Country default spread

RIL rating=AAA (https://www.icra.in/Rating/Index/?RatingType=CR&CompanyId=20990&CompanyName=Reliance%20Industries%20Limited)

Pre-tax cost of debt (RIL)= 6.68%+0.27%+1.40%=8.35%

- India's sovereign rating (Moody)=Baa2 (https://countryeconomy.com/ratings)
- Country default spread (India)=AAA Bond- Indian Bond =1.40% (http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html)

Subsidized Debt: What should we do?

- Assume that Indian govt. lends money to XYZ firm at subsidized interest rate (say 5%). In computing the cost of capital to value XYZ firm. What should we use from the following?
  - The subsidized cost of debt (5%). That is what the firm is paying.
  - The fair cost of debt (9%). That is what the firm should require its project to cover.
  - A number in the middle.

Cost of Convertible bond

- A convertible bond can be viewed as a combination of a straight bond(debt) and a conversation option (equity).
- Value of convertible bond=Value of straight bond +value of call option.
- In 2015, RIL has issued 5-year convertible bonds with a coupon rate of 4.25% and 10-year maturity, having CCC rating. The firm has to pay 10% if it had issued straight bonds at the same time. Now, the bond is trading at a price that was 112% of par.
- Value of straight bond=Rs. 818
- Value of convertible bond=(1000*1.12)=Rs. 1120
- Value of Conversion option=Rs. 1120-Rs. 818=Rs. 302

Weights for the cost of capital computation

- In computing the cost of capital for a publicly traded firm, the general rule for computing weights for debt and equity is that you use market value weights (and not book value weights). Why?
  - Because the market is often right.
  - Because market values are easy to obtain.
  - Because book values of debt and equity are meaningless.
  - None of the above.

Cost of capital approach: Good to the book..

Assuming cashflows=200, growth rate=3%

$$Value = \frac{Expected\ cashflow\ next\ year}{Cost\ of\ capital - growth} = \frac{200}{Cost\ of\ capital - growth}$$

D/(D+E)	Cost of equity	Cost of debt(post tax)	WACC	Firm Value
0	10.50%	4.80%	10.50%	2746.67
10%	11%	5.10%	10.41%	2780.03
20%	11.60%	5.40%	10.36%	2798.91
30%	12.30%	5.52%	10.27%	2835.12
40%	13.10%	5.70%	10.14%	2885.15
50%	14.50%	6.10%	10.30%	2821.92
60%	15%	7.20%	10.32%	2814.21
70%	16.10%	8.10%	10.50%	2746.67
80%	17.20%	9%	10.64%	2696.34
90%	18.40%	10.20%	11.02%	2568.58
100%	19.70%	11.40%	11.40%	2452.38

Current cost of captial: Adani Ports & Special Economic Zone Ltd.

- Equity Value: Rs. 904073.99 million
- Debt value: Long term debt (180750)+ Short-term debt (32621.2)
- Firm value: 904073.99+ 180750+ 32621.2= Rs. 1117445 million
- Equity Beta: 1.63
- Unleveraged Beta : 1.63/((1+ (213371/ 904073.99)*(1-0.34))=1.41
- EBIT= Rs. 68980.1 million
- Debt to capital ratio= 213371.2/ 1117445 =19%

Current cost of capital: Adani Ports & Special Economic Zone Ltd.

- Cost of equity=6.68%+(4.77%* 1.63)+1.47%=15.92%
- Credit rating= AA+
- Default spread=1%
- Cost of debt (pretax)= 6.68%+1%+1.40%=9.08%
- Current Cost of capital=19%*9.08*(1-0.3461)+15.92%*(1-19%)=14.023%

Credit ratings and spread for Indian firms with different levels of debt

- For each firm, we have only one rating for given level of debt. How can we find credit ratings and spread for the same firm with different levels of debt.
- I define synthetic credit ratings based on interest coverage ratio because of the following reasons.
  - It is first among the nine ratios that are used by rating agencies, such as S&P, and Moody's to determine rating.
  - The research has found a significant correlation between interest coverage ratio and bond rating.

Synthetic credit ratings (Interested coverage ratio)

http://pages.stern.nyu.edu/~adamodar/
New_Home_Page/datafile/ratings.htm

Greater Than	≤ to	Rating is	Spread is
-100000	0.199999	D2/D	18.60%
0.2	0.649999	C2/C	13.95%
0.65	0.799999	Ca2/CC	10.63%
0.8	1.249999	Caa/CCC	8.64%
1.25	1.499999	B3/B-	4.37%
1.5	1.749999	B2/B	3.57%
1.75	1.999999	B1/B+	2.98%
2	2.2499999	Ba2/BB	2.38%
2.25	2.49999	Ba1/BB+	1.98%
2.5	2.999999	Baa2/BBB	1.27%
3	4.249999	A3/A-	1.13%
4.25	5.499999	A2/A	0.99%
5.5	6.499999	A1/A+	0.90%
6.5	8.499999	Aa2/AA	0.72%
8.50	100000	Aaa/AAA	0.54%

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
2. Estimate the cost of debt at different levels of debt:
   - Default risk will increase, and bond ratings will go down as debt goes up> cost of debt will increase
   - To estimate 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.

Can we calculate for 30% level of debt?

	Current	Iteration 1	Iteration 2	Iteration 3	Iteration 4
Debt to capital	20%	30%	30%	30%	30%
Debt/Equity	25%	43%	43%	43%	43%
Firm value (Rs)	1117445	1117445	1117445	1117445	1117445
Debt value (Rs)	279361	335233.56	335233.56	335233.56	335233.56
EBIT (Rs)	68980.1	68980.1	68981.1	68981.1	68981.1
Interest payment (Rs)	6263	28897	31344	35065	37077
Interest coverage ratio	11.01	2.38	2.20	1.96	1.86
Expected rating	AA+	AA+	Baa2/BBB	Ba2/BB	B1/B+
Risk-free rate	6.68%	6.68%	6.68%	6.68%	6.68%
Country-risk premium	1.40%	1.40%	1.40%	1.40%	1.40%
Default spread	0.54%	0.54%	1.27%	2.38%	2.98%
Expected Interest rate	8.62%	8.62%	9.350%	10.460%	11.060%

What would be the cost of debt @ 40% debt?

	Iteration 1	Iteration 2	Iteration 3
Debt ratio	0.4	0.4	1.4
Debt/Equity	67%	67%	67%
Firm value (Rs)	1117445	1117445	1117445
Debt value (Rs)	446978.08	446978.08	446978.08
EBIT (Rs)	68982.10	68982.10	68982.10
Interest payment (Rs)	49435.78	55648.77	74734.73
Interest coverage ratio	1.40	1.24	0.92
Expected rating		B3/B-	Caa/CCC
Default spread		4.37%	8.64%
Expected Interest rate	11.06%	12.45%	16.72%

Bond rating, and cost of debt

Debt portion	Rating	Interest rate	Debt value	Interest amount	EBIT	Interest coverage ratio	Tax Rate
0	AAA	8.62%	0	0	68980	Infinte	34.00%
0.1	AAA	8.62%	111745	9632	68980	7.16	34.00%
0.2	AA+	9.08%	223489	20293	68980	3.40	34.00%
0.3	B1/B+	11.06%	335234	37077	68980	1.86	34.00%
0.4	B2/B	16.72%	446978	74735	68980	0.92	31.38%
0.5	Ca2/CC	18.71%	558723	104537	68980	0.66	22.44%
0.6	C2/C	22.03%	670467	147704	68980	0.47	15.88%
0.7	C2/C	22.03%	782212	172321	68980	0.40	13.61%
0.8	D2/D	26.68%	893956	238508	68980	0.29	9.83%
0.9	D2/D	26.68%	1005701	268321	68980	0.26	8.74%

Adjusted marginal tax rate

- You need taxable income for interest to provide a tax savings. Note that the EBIT at Adani is Rs. 68980.1 million. As long as interest expenses are less than Rs 68980.1 million, interest expenses remain fully tax-deductible and earn the 34% tax benefit. However, at 40% debt ratio, interest expenses are Rs 74735 million, which is greater than EBIT of Rs 68980.1 million. We consider the tax benefit on the interest expenses up to this amount.
  - Maximum tax benefits=EBIT*Margin tax rate= 68980.1*0.34= Rs 23453.23 million
  - Adjusted marginal tax rate=Maximum tax benefit/Interest expenses= 23453.23/ 74735=31.38%

Cost of equity

debt portion	Debt to equity	Interest rate	Tax Rate	Unlevered beta	Equity beta	Cost of equity
0	0.00	8.62%	34.00%	1.41	1.410	14.88%
0.1	0.11	8.62%	34.00%	1.41	1.513	15.37%
0.2	0.25	9.08%	34.00%	1.41	1.643	15.99%
0.3	0.43	11.06%	34.00%	1.41	1.809	16.78%
0.4	0.67	16.72%	31.38%	1.41	2.055	17.95%
0.5	1.00	18.71%	22.44%	1.41	2.504	20.09%
0.6	1.50	22.03%	15.88%	1.41	3.189	23.36%
0.7	2.33	22.03%	13.61%	1.41	4.252	28.43%
0.8	4.00	26.68%	9.83%	1.41	6.956	41.33%
0.9	9.00	26.68%	8.74%	1.41	13.912	74.51%

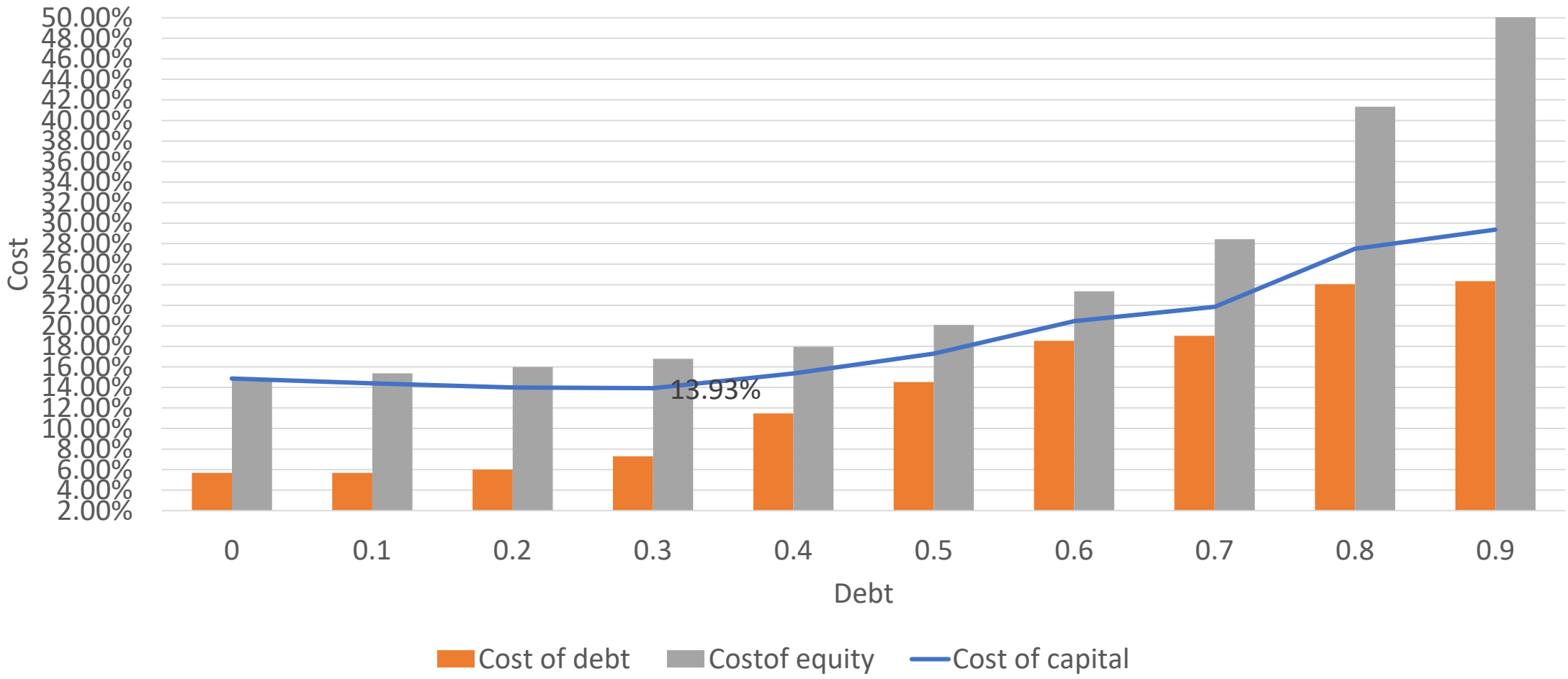
Equity beta=1.41*(1+D/E*(1-tax rate)=

Cost of equity=6.68%+1.41*4.77%+1.47%= 14.88%

Cost of capital (WACC)

debt portion	Debt to equity	Interest rate	Tax Rate	After tax cost of debt	Cost of equity	WACC
0	0.00	8.62%	34.00%	5.69%	14.88%	14.88%
0.1	0.11	8.62%	34.00%	5.69%	15.37%	14.40%
0.2	0.25	9.08%	34.00%	5.99%	15.99%	13.99%
0.3	0.43	11.06%	34.00%	7.30%	16.78%	13.93%
0.4	0.67	16.72%	31.38%	11.47%	17.95%	15.36%
0.5	1.00	18.71%	22.44%	14.51%	20.09%	17.30%
0.6	1.50	22.03%	15.88%	18.53%	23.36%	20.46%
0.7	2.33	22.03%	13.61%	19.03%	28.43%	21.85%
0.8	4.00	26.68%	9.83%	24.06%	41.33%	27.51%
0.9	9.00	26.68%	8.74%	24.35%	74.51%	29.36%

Cost of capital: Adani Ports & Special Economic Zone Ltd.



Cost of capital approach suggest

- Adani currently has Rs 213371 million in debt. The optimal rupee debt (at 30%) is around Rs 335234 million. Adani has excess debt capacity of Rs 121863 million.
- To move to its optimal and gain the increase in value, Adani should borrow Rs 121863 million and buyback stock.
- Given the magnitude of this decision, you should expect to answer three questions:
  - Why should we do it?
  - What if something goes wrong?
  - What if we don’t want buyback stock and want to make investments with additional debt capacity?

Why should we do it? Effect on Firm Value – Full Valuation

- Step 1: estimate the cashflows to Adani:
  - Free cashflow to Firm =EBIT*(1-t) (intuitively)
  - FCFF= 68980.1*(1-0.34)=Rs 45526.87 million
- Step 2: Back out the implied growth rate in the current market value.
  - Current market value of firm=Rs 1117445 million
  - Firm value=FCFF*(1+growth)/(WACC-growth)
  - WACC=14.023%
  - $1117445=\frac{45526.87*(1+growth)}{(14.023\%--growth)}$
  - Implied growth=9.56%

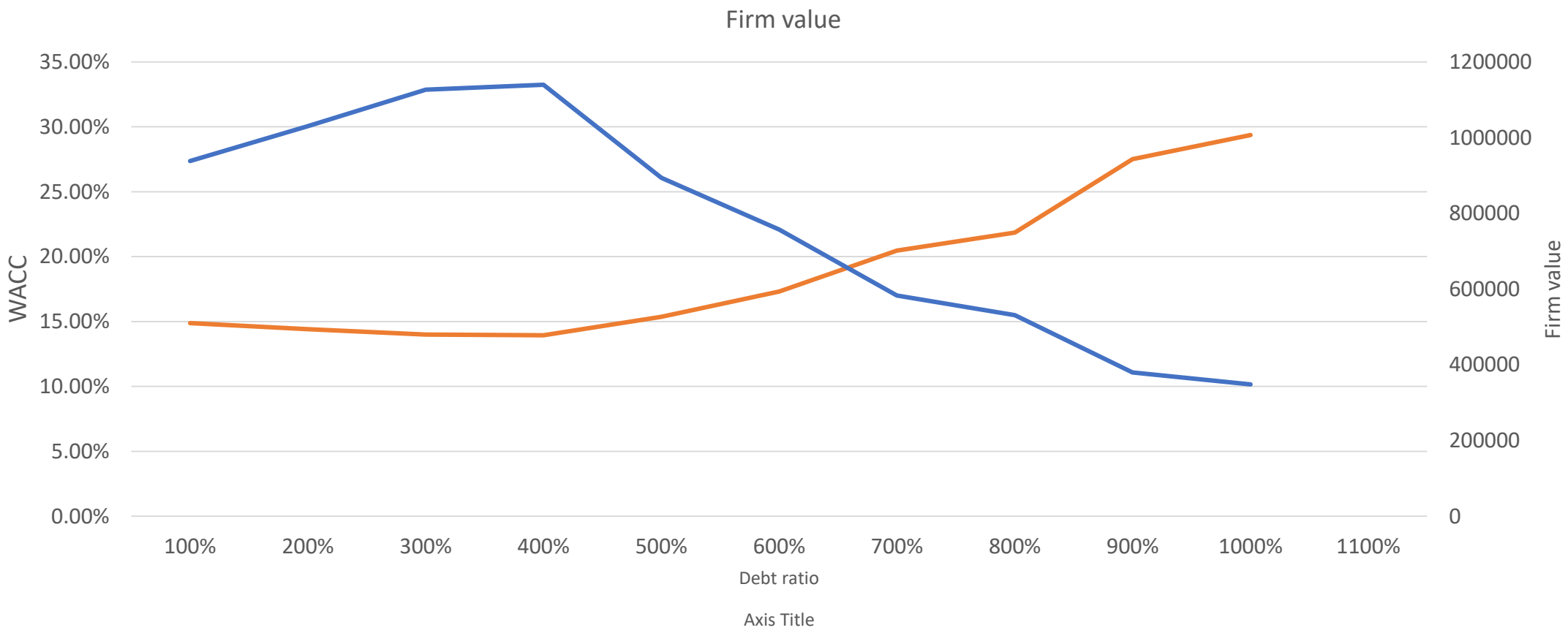
Revalue firms

- Step 3: Revalue the firm with the new cost of capital
  - Firm value=$\frac{FCFF*(1+growth)}{Cost\ of\ capial-growth} = \frac{45526.87*(1+9.56\%)}{(13.93\%-9.56\%)}$=Rs 1140033 million
  - Increase in firm value= 1140033- 1117445=Rs 22588 million

Firm value

Debt (%)	EBIDT	Tax rate	Implired Growth	WACC	FCFF	Firm value
0%	68980	34.00%	9.56%	14.88%	45527	938216
10%	68980	34.00%	9.56%	14.40%	45527	1030215
20%	68980	34.00%	9.56%	13.99%	45527	1126553
30%	68980	34.00%	9.56%	13.93%	45527	1140033
40%	68980	31.38%	9.56%	15.36%	47333	893899
50%	68980	22.44%	9.56%	17.30%	53504	757049
60%	68980	15.88%	9.56%	20.46%	58027	582993
70%	68980	13.61%	9.56%	21.85%	59592	531112
80%	68980	9.83%	9.56%	27.51%	62197	379584
90%	68980	8.74%	9.56%	29.36%	62951	348239

Firm value, cost of capital, and debt ratio



Effect on Value: Incremental approach

- Firm value @ 30% debt= 1140033-1117445=Rs. 22588 million
- Saving (cost of capital)=13.93%-14.023%= -0.093%
- Annual saving next year=(13. 93%-14.023%)*1117445= Rs. 1039.22 million
- Increase in value= 1039.22 /(13.93%-9.56%)=Rs 23780.77 million
- Enterprise value after recapitalization
  - =Existing enterprise value +PV of savings=Rs 1140033 + Rs 23780.77=Rs 1163813.77

From Firm value to per share value: The rational investor solution

- Total outstanding stocks 2070.95 million
- Increase in value per share= 23780.77 million/ 2070.95 million=Rs 11.48 per stock
- Expected stock value=Current Market Price +Increase in per share value
- = 436+11.48= Rs.447.48

What if buy-buy price is equal to fair value?

- New borrowed amount=Rs. 121862.8 million
- With the buyback price of Rs. 447.48, How many stock can be bought back= 121862.8/447.48=272.33 million
- New outstanding share after buy back: 2070.95 -272.33=Rs.1798.62 million
- Value of equity after buy-back
  - ❑Optimal firm value=Rs 1141225.77 million
  - ❑Debt value (30%)= Rs. 335234 million
  - ❑Equity value= Rs 1141225.77- Rs. 335234 =Rs. 805991.77 million
  - ❑Value per share after buyback= 805991.77/1798.62 =Rs. 448.11

What if buy-buy price is equal to current market price Rs 436?

Normalized operating income

- A key input that drives the optimal capital structure is current operating income . If the income is low, either because the firm is cyclical firm or because there are some specific factors that are expected to be temporary, the optimal debt ratio that will emerge from the analysis will be much lower than the firm’s true optimal. For instance, if we use estimate optimal debt ratio just after to a recession, the operating income which we consider is likely to be lower.
- If you are cyclical firms, earnings will track the economy looked abnormally high in boom years and abnormally low or negative in recession years.
- Since you are making a judgment on debt capacity for the long-term, you should be borrowing on income that you can generate across a cycle, not just the most recent year.

How to normalize operating income?

- Go back over time to cover an entire cycle or better still, more than on economic cycle.
- You can average across the cycle, but if the firm is growing up.
- For growing firm, you may consider future sales and profit margin of the industry. Operating profit would be sales*profit margin of industry.

What if something goes wrong? The downside risk

Sensitivity to assumptions

- **What if analysis:** As we know the operating debt ratio is a function of inputs on operating income, tax rates, and macro variables. It is a good idea look at the historical operating profit to understand the volatility of operating profit and perform what if analysis.
- **Economic scenario approach:** we can develop different economic scenario, based on economic conditions, and examine the optimal debt ratio under each one. For instance, we could look at the optimal debt ratio for a cyclical firm under a book economy, a regular economy and an economy in recession.

Adani Ports & Special Economic Zone Ltd: Safty buffers

EBIT drops by	EBIT	Optimal debt ratio
0%	68980.1	30%
10%	62082.1	30%
20%	49665.7	20%

Constraints on Ratings

- Management often defines a “desired rating” below which they do not want to fall. For example, Adani port’s management wants to maintain at least AA+
  - In order to borrow funds for future requirements
- Every rating constraint has a cost.
  - The cost of a rating constraint is the difference between the unconstraint value and the value of firm with the constraint
  - Managers should be aware of above cost of constraint.

Cost of rating constraint for Adani Port

- If managers insisted on AA+ rating, the optimal debt ratio for Adani port is then 20%, and the cost of ratings constraint would be:
- Cost of ratings constraint=Value of firm at unconstraint optimal-value of firm at constraint optimal
- =Value of firm at 30% debt-value of firm at 20% debt
- = 1140033-1126553=Rs 13,480 million

Will the optimal be different if you invest in projects instead of buying back stock?

- The optimal debt ratio is ultimately a function of the underlying riskiness of the business in which you operate.
- Will the optimal be different if you invest in projects instead of buying back stock?
  - No, as long as the projects financed are the same business mix that the firm has always been in
  - Yes, if the projects are entirely different types of business.

Design the perfect financing instrument

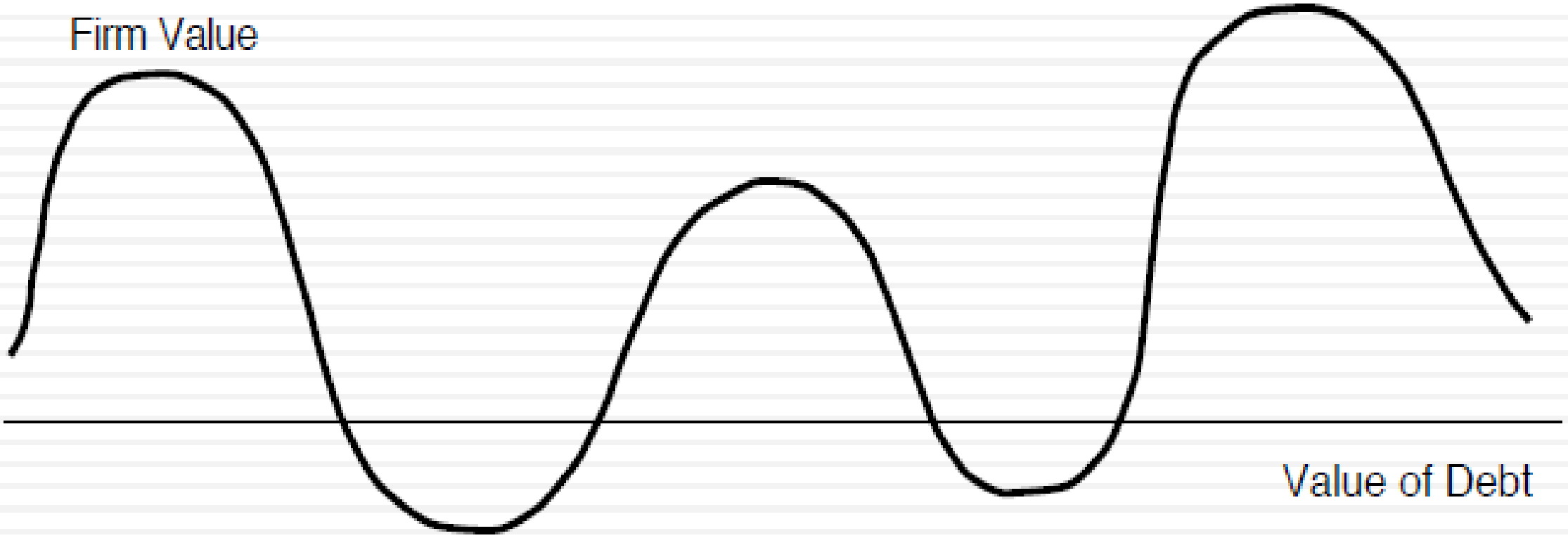
A Rationale for Debt/Equity Securities

- Value of Levered Firm = Value of Unlevered Firm + PV of Tax Benefits - PV of Expected Bankruptcy Costs.
- Since bankruptcy costs are largely a result of the fact that the firm has to make fixed payments even in periods when earnings are poor, consider borrowing money on a security where interest payments are not fixed but vary as earnings vary. This reduces the expected bankruptcy cost and increases both the optimal debt ratio for a firm and the total firm value at that leverage.

Design the perfect financing instrument

- 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.

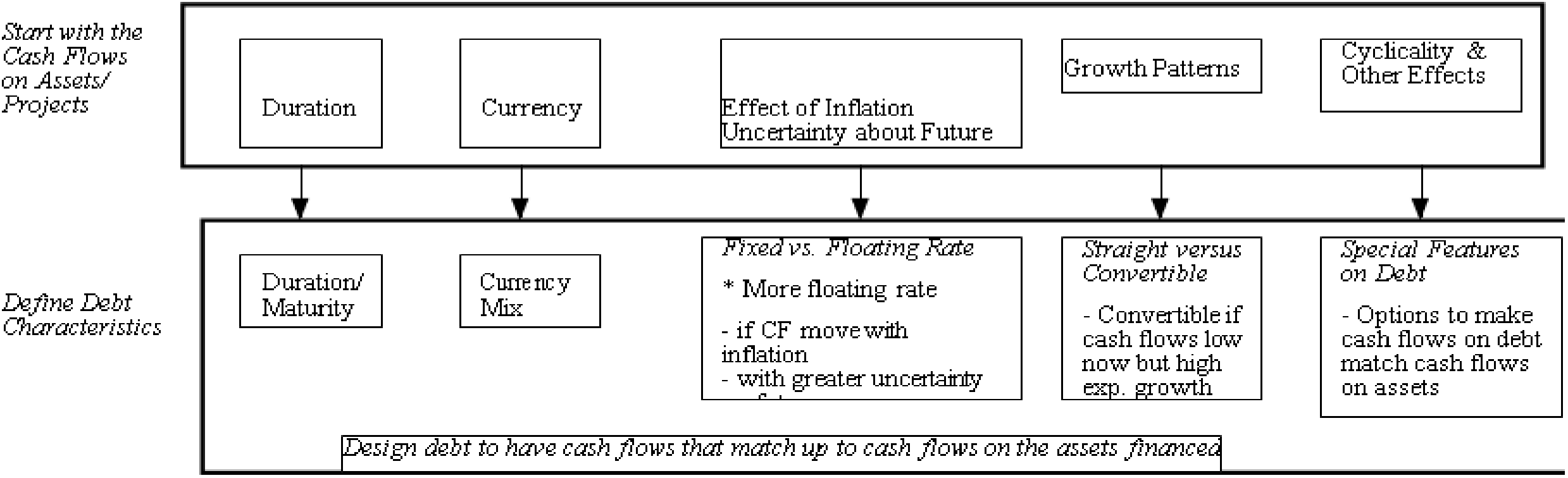
Firm with mismatched debt



Firm with matched Debt

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



Approaches for evaluating Asset Cash Flows

- Intuitive Approach
  - Are the projects typically long term or short term? What is the cash flow pattern on projects?
  - How much growth potential does the firm have relative to current projects?
  - How cyclical are the cash flows? What specific factors determine the cash flows on projects?
- Project Cash Flow Approach
  - Estimate expected cash flows on a typical project for the firm
  - Do scenario analyses on these cash flows, based upon different macro economic scenarios

Intuitive Approach - Reliance Industries Limited

Business	**Project cashflow characteristic**	**Type of financing**
Energy, petrochemicals, and natural resources	Projects are likely to be 1. Very long-term 2. Currency will be a function of the region (rather than country) where resources are located. 3. Affected by success of exploration	Debt should be 1. Long-term 2. Mix of currencies, based on resources location. 3. If possible, tied to the success of exploration.
Textiles, and retail	The projects are likely to 1. Be short-term 2. Have cash outflows primarily in rupee (because Textiles and retail originate from India)	Debt should be 1. Short-term 2. Indian currency debt
Telecommunications	Projects are likely to 1. Be short- to medium-term, with high growth potential and significant risk 2. Cashflows are likely to be in Indian rupee.	Debt should be short-term-medium term , convertible Indian rupee debt.

Application Test: Choosing your Financing Type

- Based upon the business that your firm is in, and the typical investments that it makes, what kind of financing would you expect your firm to use in terms of
  - Duration (long term or short term)
  - Currency
  - Fixed or Floating rate
  - Straight or Convertible

Project Specific Financing

- With project specific financing, you match the financing choices to the project being funded. The benefit is that the debt is truly customized to the project.
- Project specific financing makes the most sense when you have a few large, independent projects to be financed. It becomes both impractical and costly when firms have portfolios of projects with interdependent cashflows.

Duration of project cashflows

Year	Annual Cashflow	Terminal Value	Present Value @8.46%	Present value *t
0	-$2,000		-$2,000	$0
1	-$1,000		-$922	-$922
2	-$859		-$730	-$1,460
3	-$267		-$210	-$629
4	$340		$246	$983
5	$466		$311	$1,553
6	$516		$317	$1,903
7	$555		$314	$2,200
8	$615		$321	$2,568
9	$681		$328	$2,952
10	$715	$11,275	$5,321	$53,206
			$3,296	$62,355
				18.91893724

Duration of the project=18.91 years

The perfect debt…

- The perfect debt for this project would have a duration of roughly 19 years and be in a mix of Indian and dollar (since it has most of revenue from US dollar).

Analyzing RIL’s current debt

- RIL has Rs 23,107 crore interest bearing market debt with a face value weighted average maturity of 19.15 years.
- Bank loan with average life of 5 years is 58,140 crore.
- RIL is not having much foreign currency loans.
- RIL is not having convertible bond