Danger and Opportunity: Dealing with Risk

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Here is a good definition of 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 crisis, reproduced below, give a much better description of risk.

- The first symbol is the symbol for "danger", while the second is the symbol for "opportunity", making risk a mix of danger and opportunity.

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 delineate what types of risk are rewarded and what are not, and provide a rationale for the delineation.
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 conclusions 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.

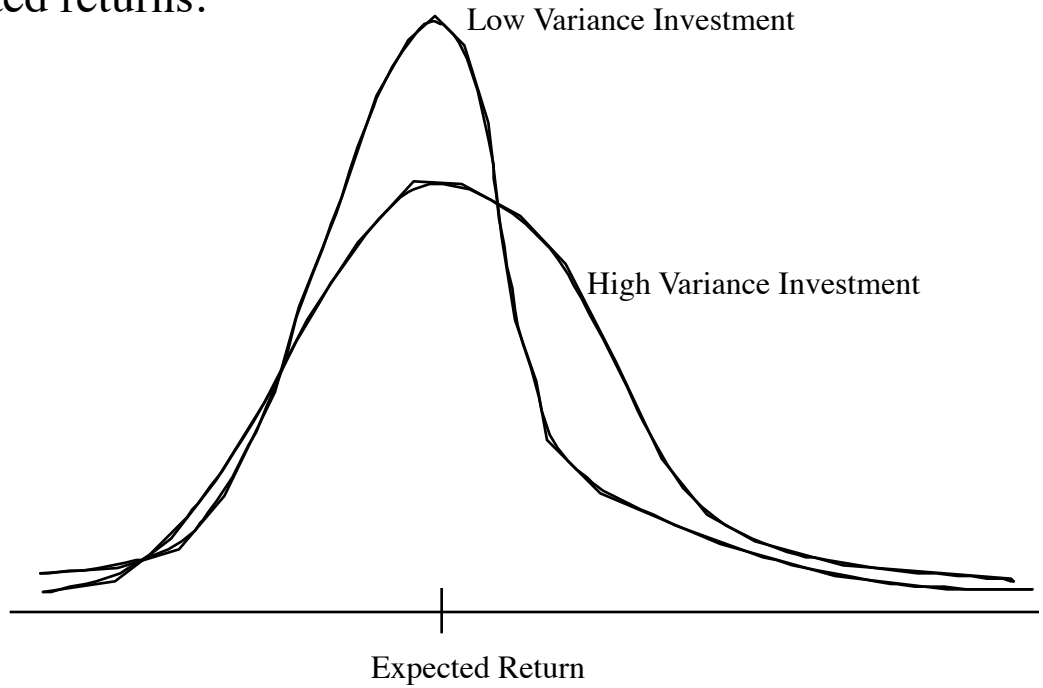
The Capital Asset Pricing Model

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

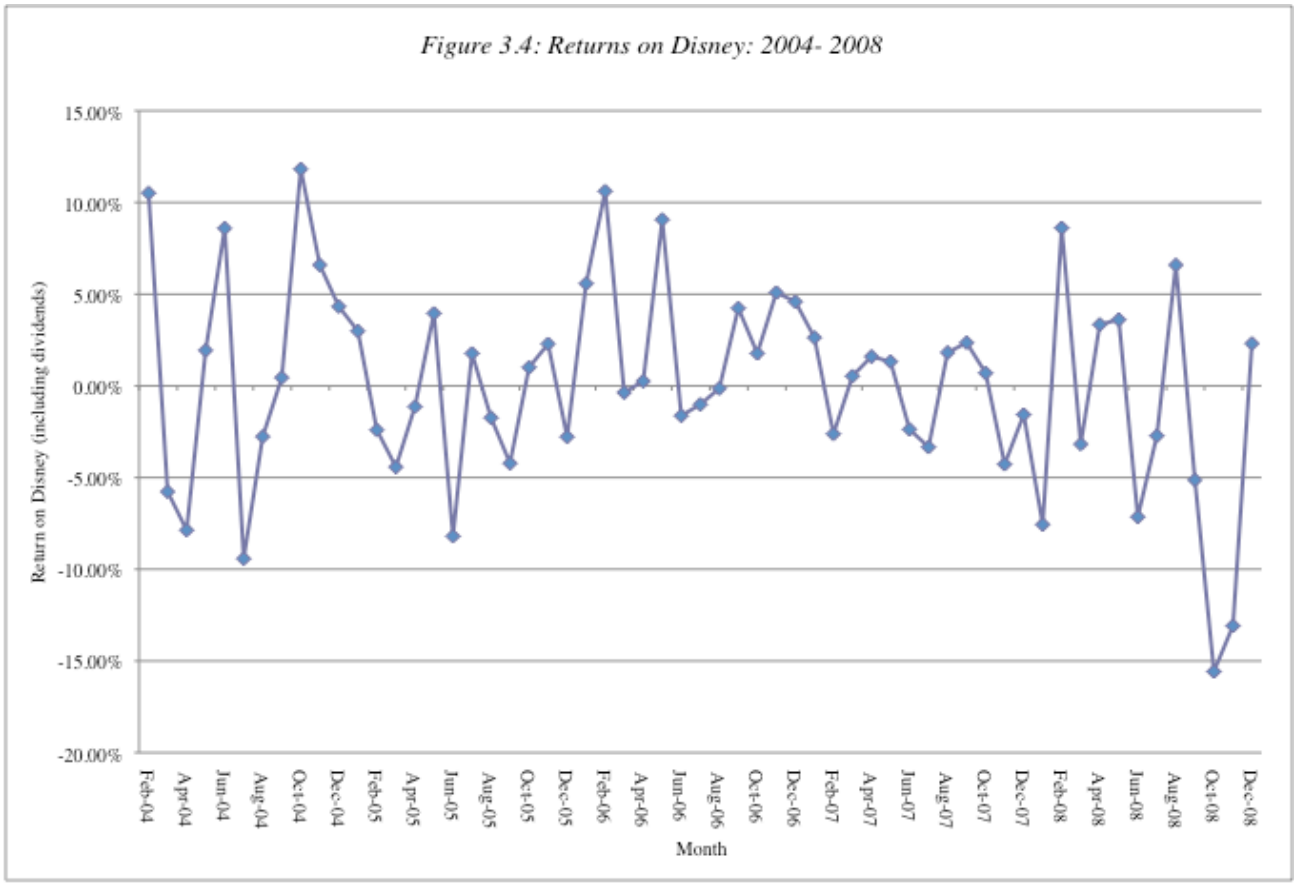
  Expected Return = Riskfree rate + Beta * Risk Premium
- Works as well as the next best alternative in most cases.

The Mean-Variance Framework

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

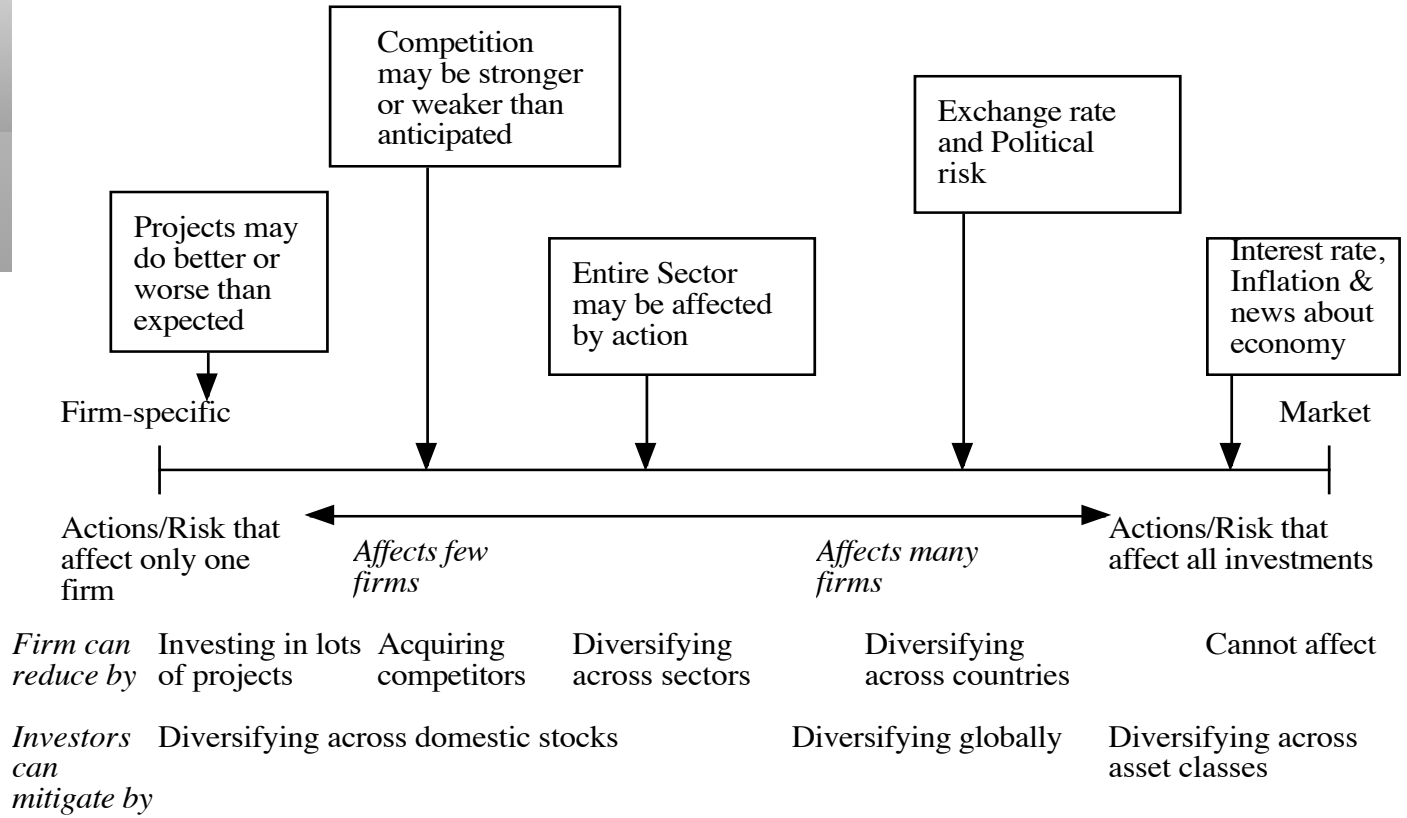


How risky is Disney? A look at the past…



The Importance of Diversification: Risk Types

Figure 3.5: A Break Down of Risk



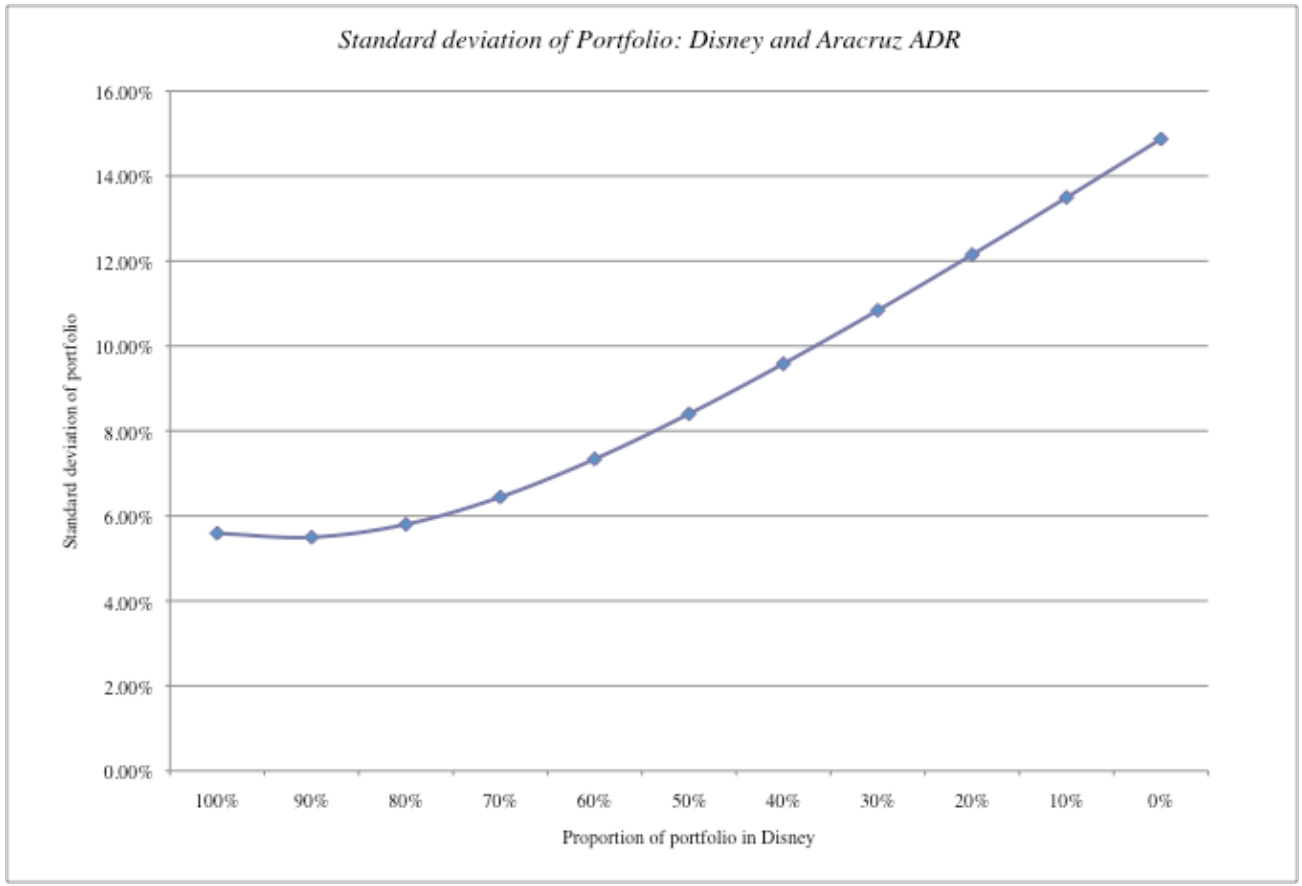
The Effects of Diversification

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

A Statistical Proof that Diversification works… An example with two stocks..

	Disney	*Aracruz ADR*
Average Monthly Return	0.18%	-0.74%
Standard Deviation in Monthly Returns	5.59%	14.87%

The variance of a portfolio…



A caveat on diversification: The lessons of 2008

- Diversification reduces exposure to risks that are uncorrelated. It cannot eliminate your exposure to correlated risks.
- Two phenomena are undercutting the effectiveness of diversification:
  - Globalization: As companies and investors globalize, the correlation across global economies and markets is increasing. The benefits to diversification are therefore dropping.
  - Securitization: As more and more asset classes become securitized (accounts receivable, mortgages, commodities…), the correlation across asset classes is increasing.
- When there is a crisis of confidence and investors become more risk averse, the correlation across all risky assets increases, thus undercutting the benefits of diversification when you need it the most.

The Role of the Marginal Investor

- The marginal investor in a firm is the investor who is most likely to be the buyer or seller on the next trade and to influence the stock price.
- Generally speaking, the marginal investor in a stock has to own a lot of stock and also trade a lot.
- Since trading is required, the largest investor may not be the marginal investor, especially if he or she is a founder/manager of the firm (Michael Dell at Dell Computers or Bill Gates at Microsoft)
- 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[a]
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

Analyzing the investor bases…

	Disney	*Deutsche Bank*	*Aracruz (non-voting)*	*Tata Chemicals*
Institutions	72%	76%	32%	47%
Individuals	21%	23%	60%	24%
Insiders	7%	1%	8%	29%*

Looking at Disney's top stockholders in 2009 (again)

DIS US $ ↑ 24.2422 +.7422 D 2s EquityHDS
DELAY 14:27 Vol 6,135,972 Op 23.81 Z Hi 24.34 T Lo 23.8 T ValTrd 148.014m
DIS US Equity | 95) Saved Searches | 96) Default Settings | Page 1/150 Holdings Search
Walt Disney Co/The CUSIP 25468710
21) Sources | 22) Types | 23) Countries | 24) Metro Areas | 25) Advanced Filters
Name Filter | Sort By Mkt Val

	Holder Name	Portfolio Name	Source	Mkt Val	% Out	Mkt Val Chg	File Dt
1)	JOBS STEVEN PAUL	n/a	Form 4	3.34BLN	7.46	0	5/5/06
2)	FIDELITY MANAGEMENT &	FIDELITY MANAGEMEN	13F	2.05BLN	4.58	-36.12MLN	9/30/08
3)	STATE STREET CORP	STATE STREET CORPO	13F	1.7BLN	3.79	-18.6MLN	9/30/08
4)	BARCLAYS GLOBAL INVES	BARCLAYS GLOBAL IN	13F	1.66BLN	3.70	-160.12MLN	9/30/08
5)	VANGUARD GROUP INC	VANGUARD GROUP IN	13F	1.38BLN	3.08	-6.82MLN	9/30/08
6)	SOUTHEASTERN ASSET M	SOUTHEASTERN ASSE	13F	1.12BLN	2.50	-14.03MLN	9/30/08
7)	STATE FARM MUTUAL AU	STATE FARM MUTUAL	13F	1.02BLN	2.28	0	9/30/08
8)	WELLINGTON MANAGEMEN	WELLINGTON MANAGE	13F	939.38MLN	2.09	110.6MLN	9/30/08
9)	CLEARBRIDGE ADVISORS	CLEARBRIDGE ADVISO	13F	815.91MLN	1.82	-47.04MLN	9/30/08
10)	JP MORGAN CHASE & CO	JP MORGAN CHASE &	13F	693.31MLN	1.55	-18.89MLN	9/30/08
11)	MASSACHUSETTS FINANCI	MASSACHUSETTS FINA	13F	682.16MLN	1.52	112.29MLN	9/30/08
12)	BANK OF NEW YORK MELL	BANK OF NEW YORK	13F	681.68MLN	1.52	-57.13MLN	9/30/08
13)	NORTHERN TRUST CORP	NORTHERN TRUST CO	13F	610.26MLN	1.36	-4.81MLN	9/30/08
14)	AXA	AXA	13F	486.28MLN	1.08	47.05MLN	9/30/08
15)	BLACKROCK INVESTMENT	BLACKROCK INVESTME	13F	476.12MLN	1.06	-47.11MLN	9/30/08
16)	JENNISON ASSOCIATES L	JENNISON ASSOCIATE	13F	428.85MLN	0.96	-102.77MLN	9/30/08
17)	T ROWE PRICE ASSOCIAT	T ROWE PRICE ASSOC	13F	351.61MLN	0.78	-9.94MLN	9/30/08

26) Latest Chg | 27) Hist Held % Out on Page 41.12

The Market Portfolio

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

Preferred risk level	*Allocation decision*
No risk	100% in T-Bills
Some risk	50% in T-Bills; 50% in Market Portfolio;
A little more risk	25% in T-Bills; 75% in Market Portfolio
Even more risk	100% in Market Portfolio
A risk hog..	Borrow money; Invest in market portfolio

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

The Risk of an Individual Asset

- 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)
- Beta is a standardized measure of this covariance, obtained by dividing the covariance of any asset with the market by the variance of the market. It is a measure of the non-diversifiable risk for any asset can be measured by the covariance of its returns with returns on a market index, which is defined to be the asset's beta.
- The required return on an investment will be a linear function of its beta:

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

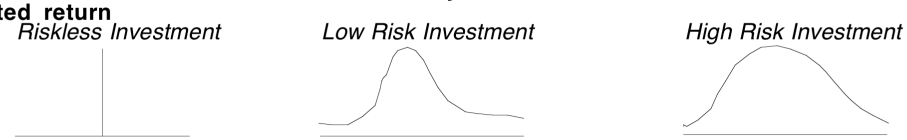
Limitations of the CAPM

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

Alternatives to the CAPM

Step 1: Defining Risk

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



Step 2: Differentiating between Rewarded and Unrewarded Risk

Risk that is specific to investment (Firm Specific)
Can be diversified away in a diversified portfolio
1. each investment is a small proportion of portfolio
2. risk averages out across investments in portfolio

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

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

Step 3: Measuring Market Risk

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

Why the CAPM persists…

- The CAPM, notwithstanding its many critics and limitations, has survived as the default model for risk in equity valuation and corporate finance. The alternative models that have been presented as better models (APM, Multifactor model..) have made inroads in performance evaluation but not in prospective analysis because:
  - The alternative models (which are richer) do a much better job than the CAPM in explaining past return, but their effectiveness drops off when it comes to estimating expected future returns (because the models tend to shift and change).
  - The alternative models are more complicated and require more information than the CAPM.
  - For most companies, the expected returns you get with the the alternative models is not different enough to be worth the extra trouble of estimating four additional betas.

Ways of dealing with risk in analysis

- Risk Adjusted Value
  - Estimate expected cash flows and adjust the discount rate for risk
  - Use certainty equivalent cash flows and use the riskfree rate as the discount rate
  - Hybrid approaches
- Probabilistic Approaches
  - Sensitivity Analysis
  - Decision Trees
  - Simulations
- Value at Risk (VAR) and variants
- Real Options

I. Risk Adjusted Value

- The value of a risky asset can be estimated by discounting the expected cash flows on the asset over its life at a risk-adjusted discount rate:

$$\text{Value of asset} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \ldots\ldots + \frac{E(CF_n)}{(1+r)^n}$$

where the asset has a n-year life, $E(CF_t)$ is the expected cash flow in period t and r is a discount rate that reflects the risk of the cash flows.

- Alternatively, we can replace the expected cash flows with the guaranteed cash flows we would have accepted as an alternative (certainty equivalents) and discount these at the riskfree rate:

$$\text{Value of asset} = \frac{CE(CF_1)}{(1+r_f)} + \frac{CE(CF_2)}{(1+r_f)^2} + \frac{CE(CF_3)}{(1+r_f)^3} \ldots\ldots + \frac{CE(CF_n)}{(1+r_f)^n}$$

where $CE(CF_t)$ is the certainty equivalent of $E(CF_t)$ and r_f is the riskfree rate.

a. Risk Adjusted Discount Rates

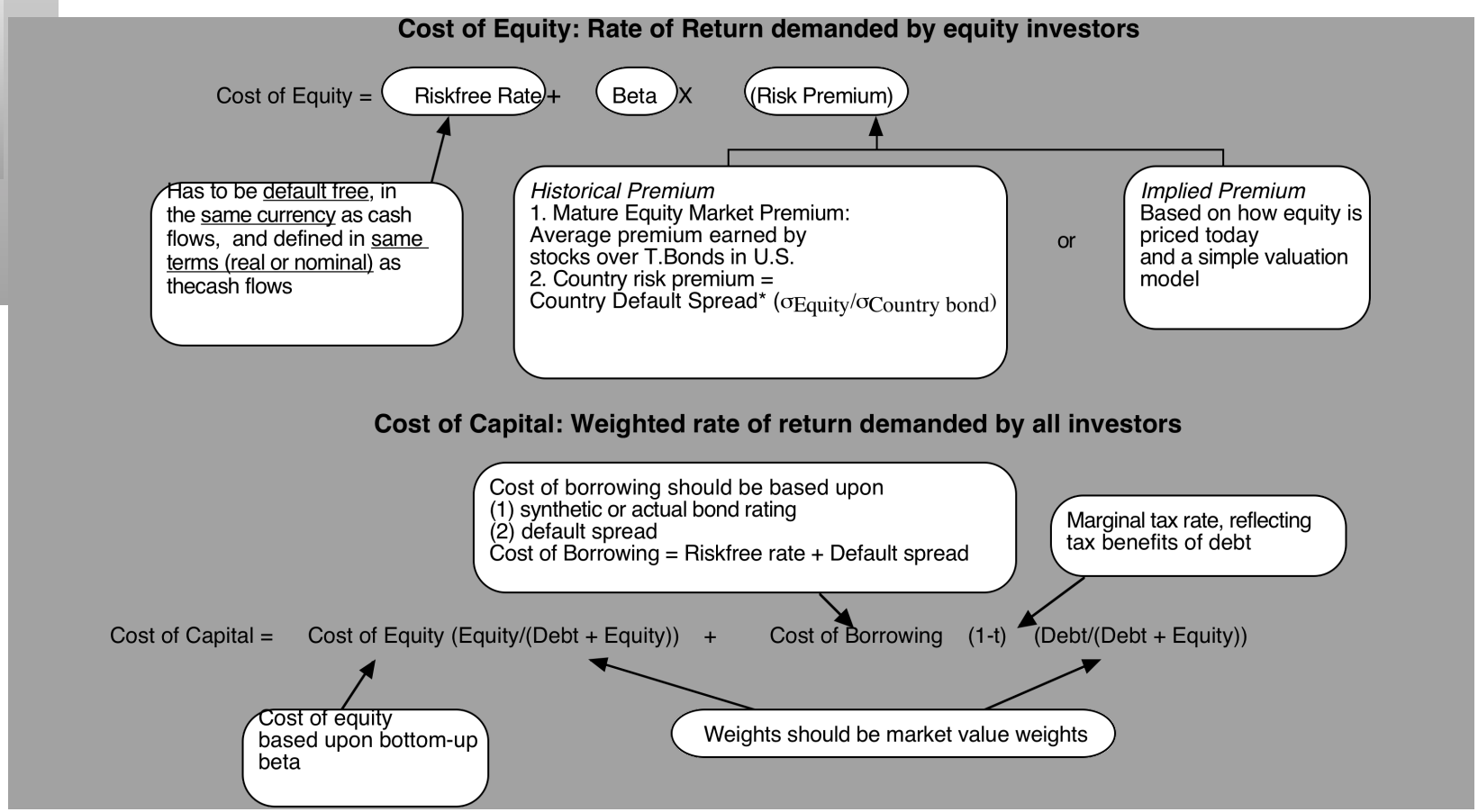
Step 1: Estimate the expected cash flows from a project/asset/business. If there is risk in the asset, this will require use to consider/estimate cash flows under different scenarios, attach probabilities to these scenarios and estimate an expected value across scenarios. In most cases, though, it takes the form of a base case set of estimates that capture the range of possible outcomes.

Step 2: Estimate a risk-adjusted discount rate. While there are a number of details that go into this estimate, you can think of a risk-adjusted discount rate as composed of two components

Risk adjusted rate = Riskfree Rate + Risk Premium

Step 3: Take the present value of the cash flows at the risk adjusted discount rate.

A primer on risk adjusted discount rates

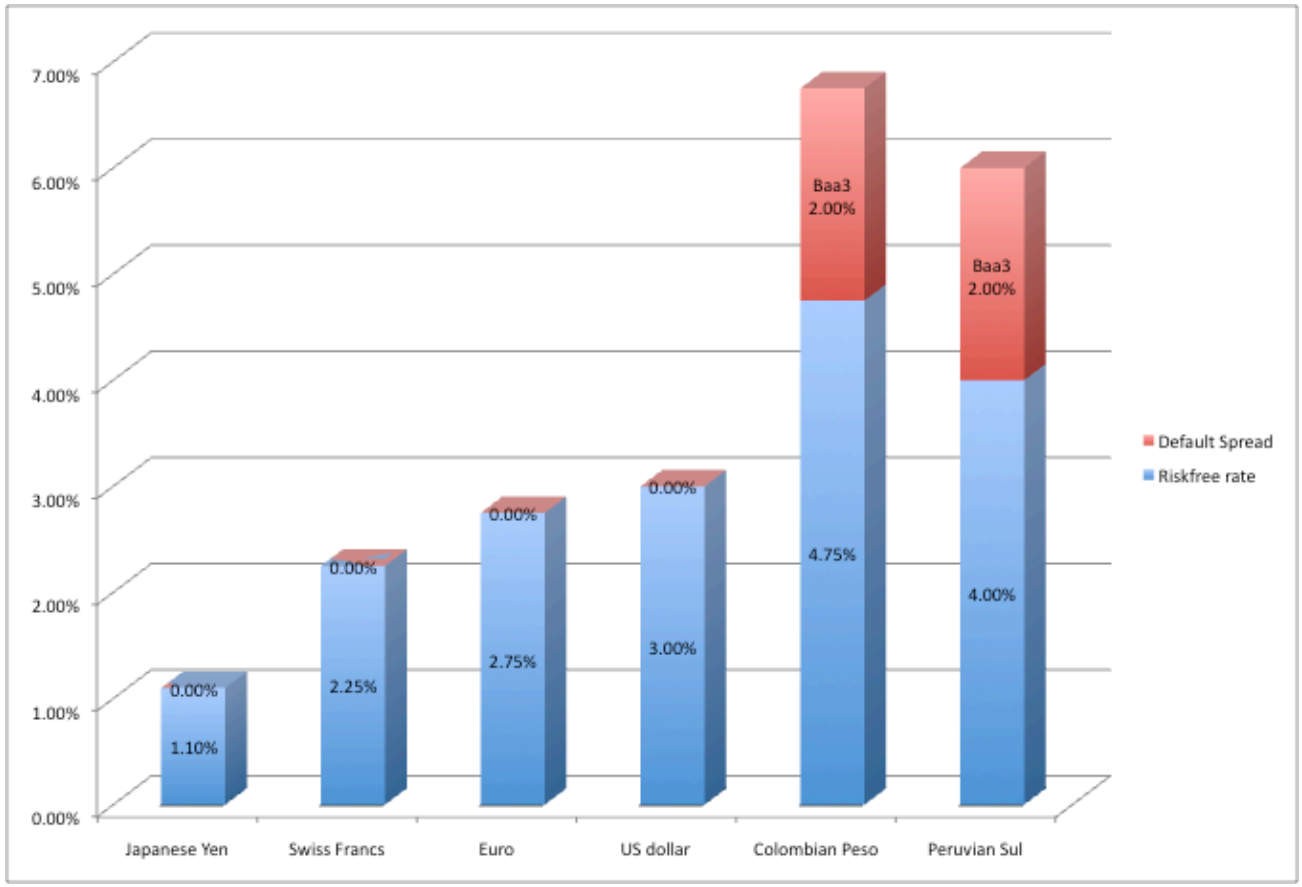


i. A Riskfree Rate

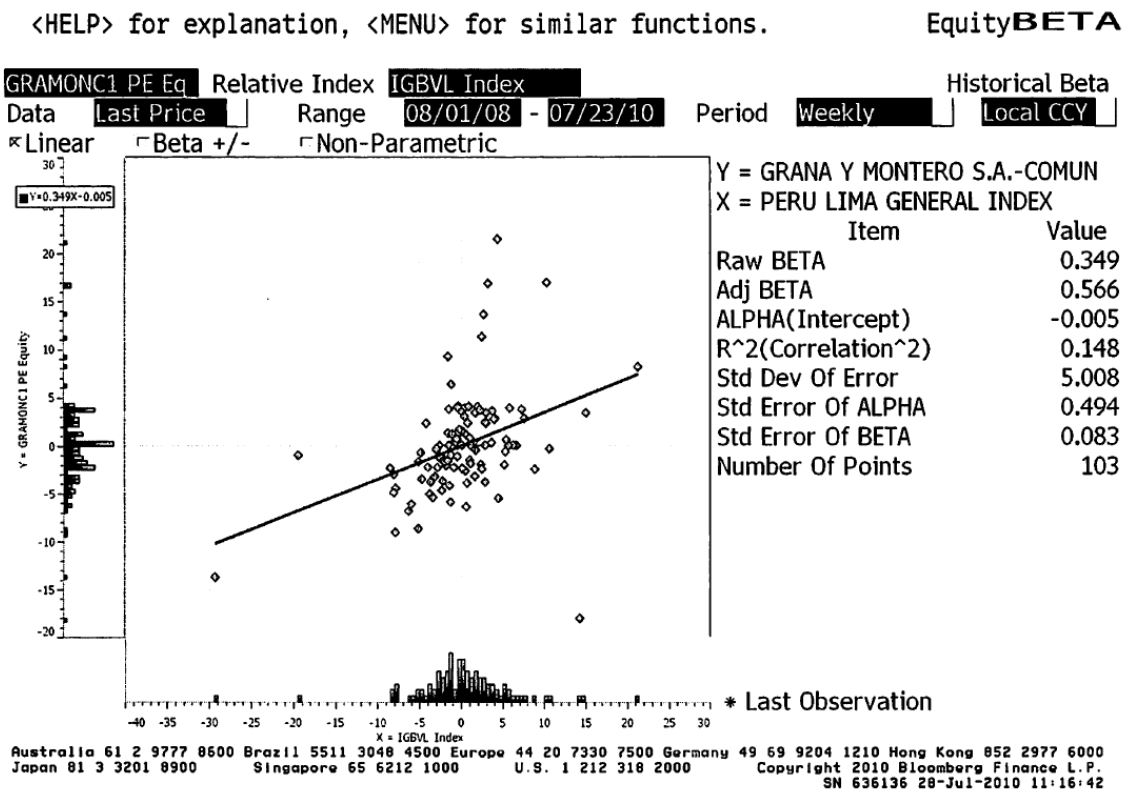
- On a riskfree asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.
- For an investment to be riskfree, then, it has to have
  - No default risk
  - No reinvestment risk

1. Time horizon matters: Thus, the riskfree rates in valuation will depend upon when the cash flow is expected to occur and will vary across time.
2. Not all government securities are riskfree: Some governments face default risk and the rates on bonds issued by them will not be riskfree.

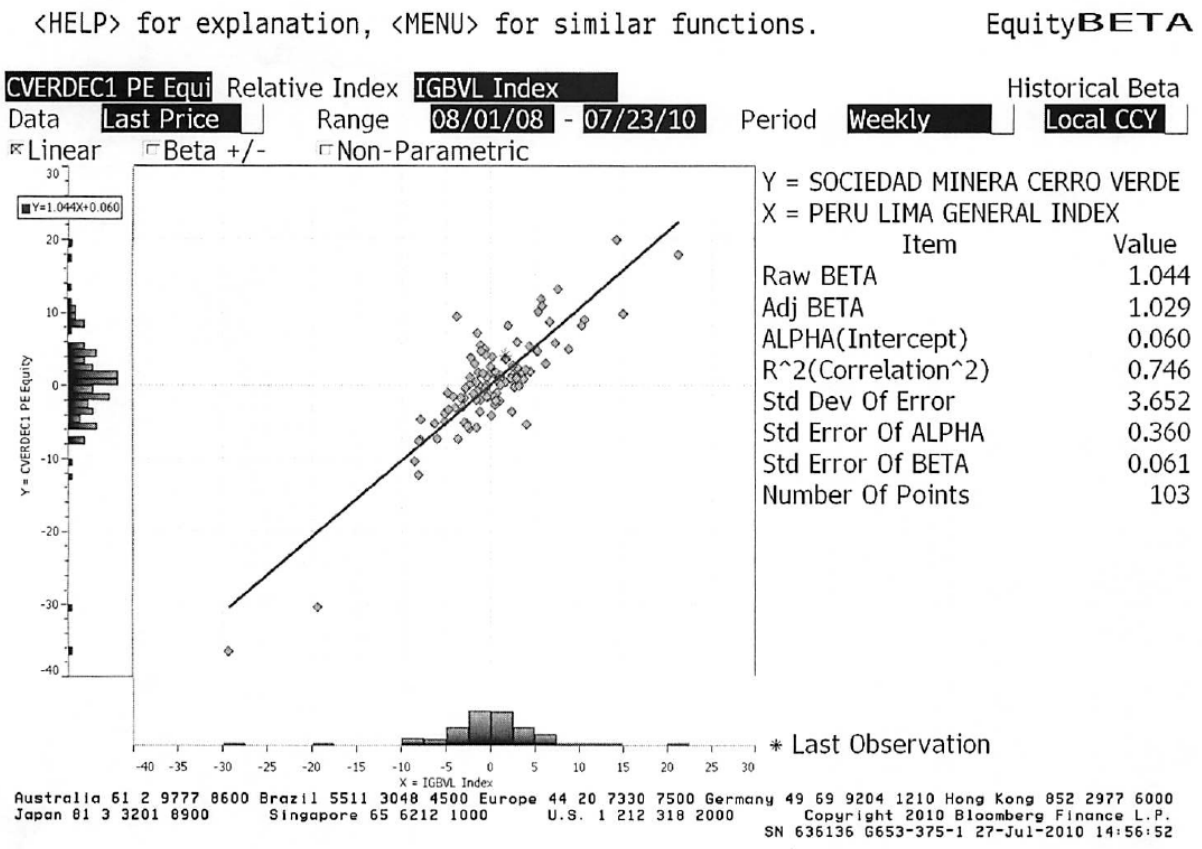
Comparing Riskfree Rates



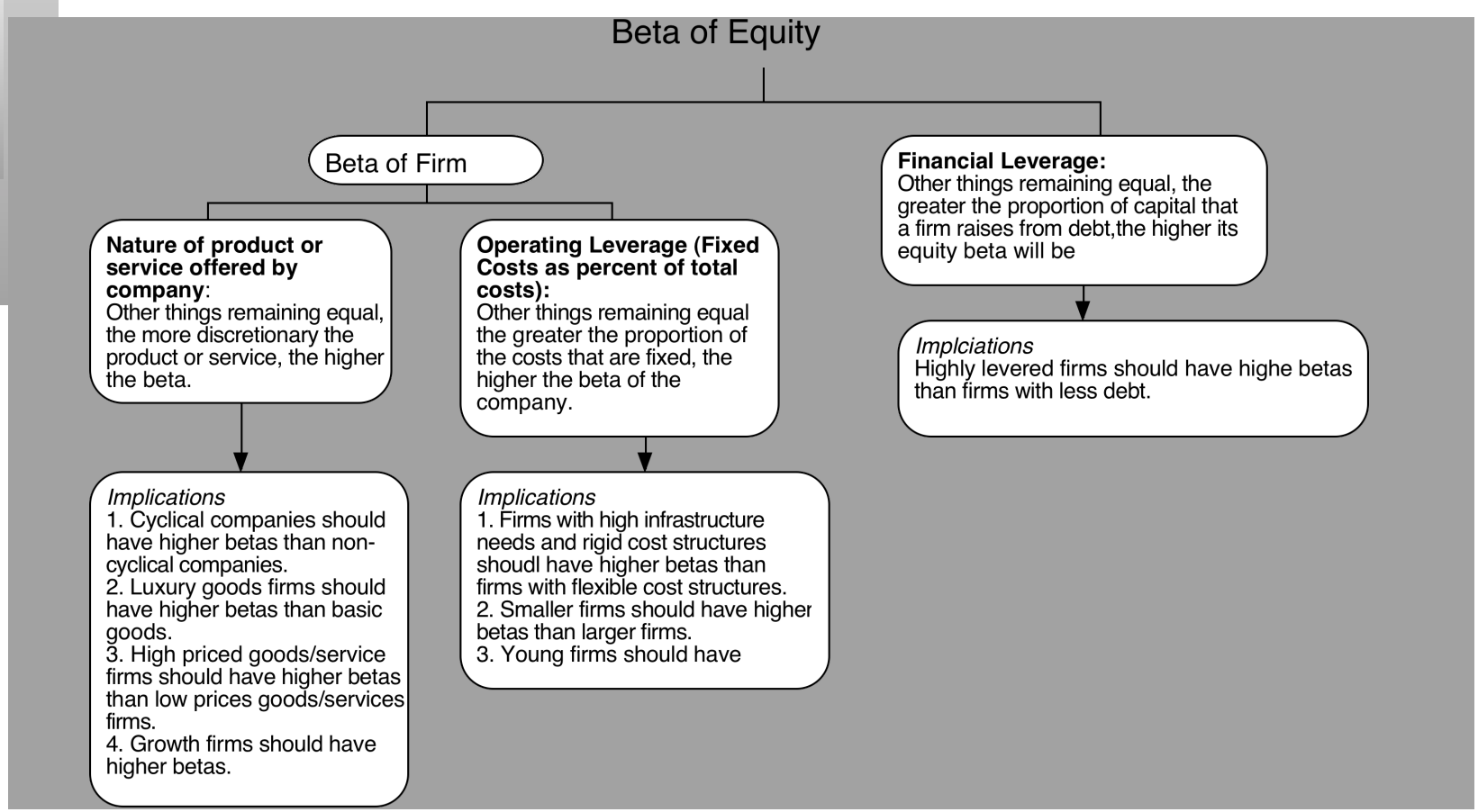
ii. Beta Estimation: A regression is not the answer…



Beta Estimation: The Index Effect



Betas don't come from regressions: The determinants of betas



One solution: Estimate sector (bottom up) betas

- The beta for a company measures its exposure to macro economic risk and should reflect:
  - The products and services it provides (and how discretionary they are)
  - The fixed cost structure (higher fixed costs -> higher betas)
  - The financial leverage (higher D/E ratio -> higher betas)
- For Grana Y Montero:

	Revenues	% of Firm	Unlevered Beta for business
Consruction	1453	77.58%	0.75
Oil Extraction	225	12.01%	0.90
Software Consulting	195	10.41%	1.20
	1873		0.81

Levered Beta = 0.81 (1+ (1-.30) (433/2400)) = 0.92

Proposition: When a firm is in multiple businesses with differing risk profiles, it should have different hurdle rates for each business.

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Disney's business breakdown

Unlevered Beta
(1 - Cash/ Firm Value)

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

A closer look at the process…
Studio Entertainment Betas

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

Disney's bottom up beta

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

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

Step 1: Start with Disney's revenues by business.

Step 2: Estimate the value as a multiple of revenues by looking at what the market value of publicly traded firms in each business is, relative to revenues.

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

Step 3: Multiply the revenues in step 1 by the industry average multiple in step 2.

- Disney has a cash balance of $3,795 million. If we wanted a beta for all of Disney's assets (and not just the operating assets), we would compute a weighted average:

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

Disney's Cost of Equity

- Step 1: Allocate debt across businesses

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

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

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

- Step 2a: Com

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

Riskfree Rate = 3.5%
Risk Premium = 6%

iii. And equity risk premiums matter..

	Arithmetic Average		Geometric Average	
	Stocks – T. Bills	Stocks – T. Bonds	Stocks – T. Bills	Stocks – T. Bonds
1928-2009	7.53%	6.03%	5.56%	4.29%
	(2.28%)	(2.40%)		
1960-2009	5.48%	3.78%	4.09%	2.74%
	(2.42%)	(2.71%)		←
2000-2009	-1.59%	-5.47%	-3.68%	-7.22%
	(6.73%)	(9.22%)		

Historical premium

In 2010, the actual cash returned to stockholders was 40.38. That was down about 40% from 2008 levels.

Analysts expect earnings to grow 21% in 2010, resulting in a compounded annual growth rate of 7.2% over the next 5 years. We will assume that dividends & buybacks will keep pace.

After year 5, we will assume that earnings on the index will grow at 3.84%, the same rate as the entire economy (= riskfree rate).

43.29 46.40 49.74 53.32 57.16

$$1115.10 = \frac{43.29}{(1+r)} + \frac{46.40}{(1+r)^2} + \frac{49.74}{(1+r)^3} + \frac{53.32}{(1+r)^4} + \frac{57.16}{(1+r)^5} + \frac{57.16(1.0384)}{(r-.0384)(1+r)^5}$$

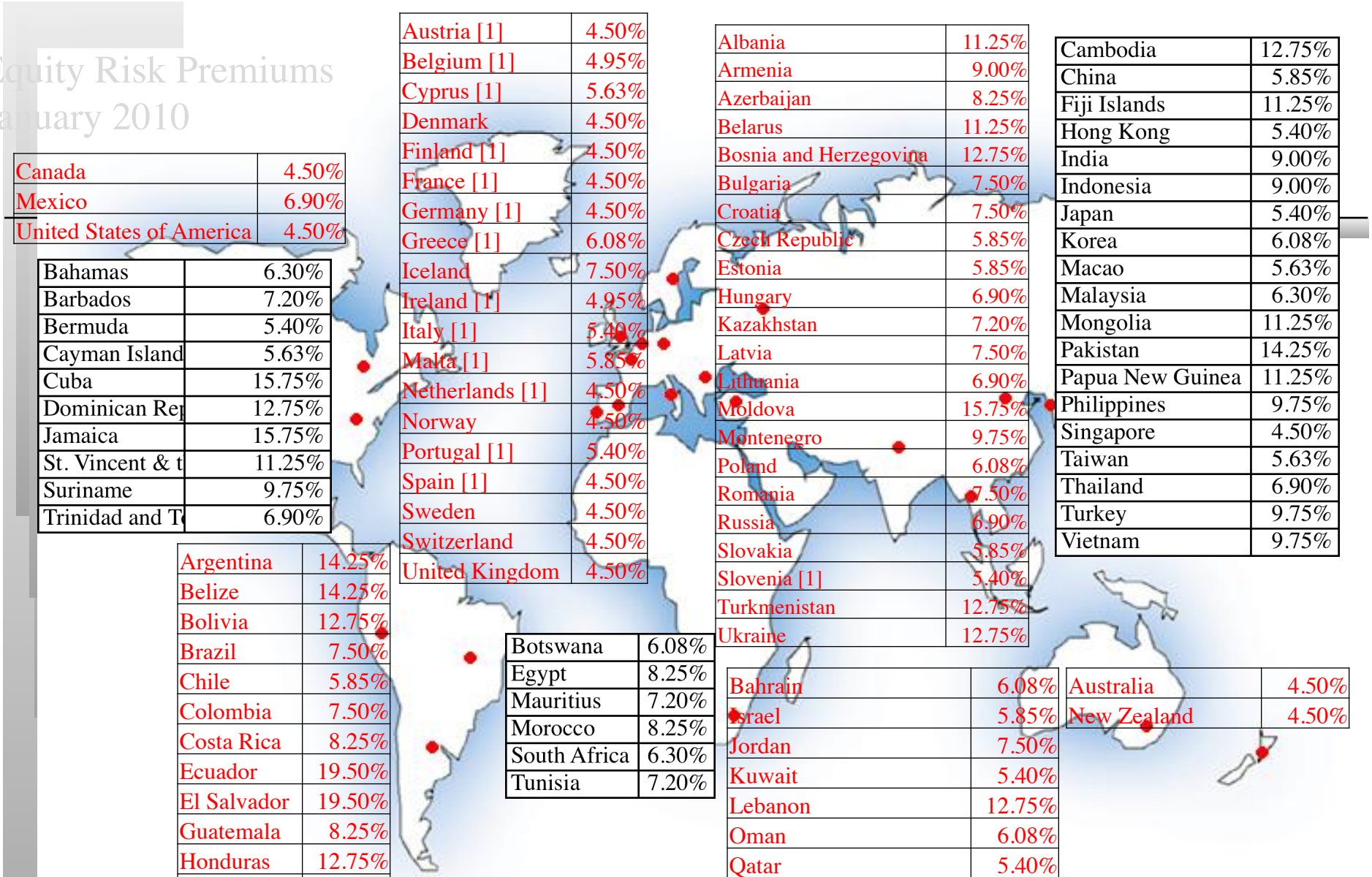
January 1, 2010
S&P 500 is at 1115.10
Adjusted Dividends & Buybacks for 2008 = 40.38

Expected Return on Stocks (1/1/10) = 8.20%
T.Bond rate on 1/1/10 = 3.84 %
Equity Risk Premium = 8.20% - 3.84% = 4.36%

Additional country risk?

- Even if we accept the proposition that an equity risk premium of about 4.5% is reasonable for a mature market, you would expect a larger risk premium when investing in an emerging market.
- Consider Peru. There is clearly more risk investing in Peruvian equities than there is in investing in a mature market. To estimate the additional risk premium that should be charged, we follow a 3-step process:
  - Step 1: Obtain a measure of country risk for Peru. For instance, the sovereign rating for Peru is Baa3 and the default spread associated with that rating in early 2010 was 2%,
  - Step 2: Estimate how much riskier equities are, relative to bonds. The standard deviation in weekly returns over the last 2 years for Peruvian equities was 26% and the standard deviation in the bond was 13%.
  - Step 3: Additional risk premium for Peru = 2% (26/13) = 3%
  - Step 4: Total equity risk premium for Peru = 4.5%+3%=7.5%

Equity Risk Premiums
January 2010



Canada	4.50%
Mexico	6.90%
United States of America	4.50%

Bahamas	6.30%
Barbados	7.20%
Bermuda	5.40%
Cayman Island	5.63%
Cuba	15.75%
Dominican Rep	12.75%
Jamaica	15.75%
St. Vincent & t	11.25%
Suriname	9.75%
Trinidad and T	6.90%

Argentina	14.25%
Belize	14.25%
Bolivia	12.75%
Brazil	7.50%
Chile	5.85%
Colombia	7.50%
Costa Rica	8.25%
Ecuador	19.50%
El Salvador	19.50%
Guatemala	8.25%
Honduras	12.75%
Nicaragua	14.25%
Panama	8.25%
Paraguay	14.25%
Peru	7.50%
Uruguay	9.75%
Venezuela	11.25%

Austria [1]	4.50%
Belgium [1]	4.95%
Cyprus [1]	5.63%
Denmark	4.50%
Finland [1]	4.50%
France [1]	4.50%
Germany [1]	4.50%
Greece [1]	6.08%
Iceland	7.50%
Ireland [1]	4.95%
Italy [1]	5.40%
Malta [1]	5.85%
Netherlands [1]	4.50%
Norway	4.50%
Portugal [1]	5.40%
Spain [1]	4.50%
Sweden	4.50%
Switzerland	4.50%
United Kingdom	4.50%

Albania	11.25%
Armenia	9.00%
Azerbaijan	8.25%
Belarus	11.25%
Bosnia and Herzegovina	12.75%
Bulgaria	7.50%
Croatia	7.50%
Czech Republic	5.85%
Estonia	5.85%
Hungary	6.90%
Kazakhstan	7.20%
Latvia	7.50%
Lithuania	6.90%
Moldova	15.75%
Montenegro	9.75%
Poland	6.08%
Romania	7.50%
Russia	6.90%
Slovakia	5.85%
Slovenia [1]	5.40%
Turkmenistan	12.75%
Ukraine	12.75%

Cambodia	12.75%
China	5.85%
Fiji Islands	11.25%
Hong Kong	5.40%
India	9.00%
Indonesia	9.00%
Japan	5.40%
Korea	6.08%
Macao	5.63%
Malaysia	6.30%
Mongolia	11.25%
Pakistan	14.25%
Papua New Guinea	11.25%
Philippines	9.75%
Singapore	4.50%
Taiwan	5.63%
Thailand	6.90%
Turkey	9.75%
Vietnam	9.75%

Botswana	6.08%
Egypt	8.25%
Mauritius	7.20%
Morocco	8.25%
South Africa	6.30%
Tunisia	7.20%

Bahrain	6.08%
Israel	5.85%
Jordan	7.50%
Kuwait	5.40%
Lebanon	12.75%
Oman	6.08%
Qatar	5.40%
Saudi Arabia	5.85%
United Arab Emirates	5.40%

Australia	4.50%
New Zealand	4.50%

An example: Rio Disney
Expected Cash flow in US $ (in April 2009)

	0	1	2	3	4	5	6	7	8	9	10
Operating Income		-$50	-$150	-$84	$106	$315	$389	$467	$551	$641	$658
Taxes		-$19	-$57	-$32	$40	$120	$148	$178	$209	$244	$250
Operating Income after Taxes		-$31	-$93	-$52	$66	$196	$241	$290	$341	$397	$408
+ Depreciation & Amortization		$50	$425	$469	$444	$372	$367	$364	$364	$366	$368
- Capital Expenditures	$2,500	$1,000	$1,188	$752	$276	$258	$285	$314	$330	$347	$350
- Change in Working Capital	$0	$0	$63	$25	$38	$31	$16	$17	$19	$21	$5
Cash flow to Firm	-$2,500	-$981	-$918	-$360	$196	$279	$307	$323	$357	$395	$422
+ Pre-Project Investment	500										
- Pre-project Deprecn * t		$19	$19	$19	$19	$19	$19	$19	$19	$19	$19
+ Fixed G&A (1-t)		$0	$78	$109	$155	$194	$213	$234	$258	$284	$289
Incremental Cash flow to Firm	-$2,000	-$1,000	-$859	-$270	$332	$454	$501	$538	$596	$660	$692

Rio Disney: Risk Adjusted Discount Rate

- Since the cash flows were estimated in US dollars, the riskfree rate is the US treasury bond rate of 3.5% (at the time of the analysis.
- The beta for the theme park business is 0.7829. This was estimated by looking at publicly traded theme park companies.
- The risk premium is composed of two parts, a mature market premium of 6% and an additional risk premium of 3.95% for Brazil.

  Country risk premium for Brazil = 3.95%

  Cost of Equity in US$= 3.5% + 0.7829 (6%+3.95%) = 11.29%

- Using this estimate of the cost of equity, we use Disney's theme park debt ratio of 35.32% and its after-tax cost of debt of 3.72%, we can estimate the cost of capital for the project:

  Cost of Capital in US$ = 11.29% (0.6468) + 3.72% (0.3532) = 8.62%

Rio Disney: Risk Adjusted Value
Risk Adjusted Discount Rates

Discounted at Rio Disney cost of capital of 8.62%

Year	Annual Cashflow	Terminal Value	Present Value
0	-$2,000		-$2,000
1	-$1,000		-$921
2	-$860		-$729
3	-$270		-$211
4	$332		$239
5	$453		$300
6	$502		$305
7	$538		$302
8	$596		$307
9	$660		$313
10	$692	$10,669	$4,970
Net Present Value =			$2,877

Does the currency matter?

- The analysis was done in dollars. Would the conclusions have been any different if we had done the analysis in Brazilian Reais?
  a) Yes
  b) No

Disney Theme Park: $R NPV

Expected Exchange Rate$_t$
= Exchange Rate today * $(1.07/1.02)^t$

Discount at $R cost of capital
= (1.0862) (1.07/1.02) – 1 = 13.94%

Year	Cashflow ($)	R$/$	Cashflow (R$)	Present Value
0	-$ 2,000.00	R$ 2.04	-R$ 4,080.00	-R$ 4,080.00
1	-$ 1,000.00	R$ 2.14	-R$ 2,140.00	-R$ 1,878.14
2	-$ 859.50	R$ 2.24	-R$ 1,929.49	-R$ 1,486.19
3	-$ 270.06	R$ 2.35	-R$ 635.98	-R$ 429.92
4	$ 332.50	R$ 2.47	R$ 821.40	R$ 487.32
5	$ 453.46	R$ 2.59	R$ 1,175.12	R$ 611.87
6	$ 501.55	R$ 2.72	R$ 1,363.46	R$ 623.06
7	$ 538.06	R$ 2.85	R$ 1,534.43	R$ 615.39
8	$ 595.64	R$ 2.99	R$ 1,781.89	R$ 627.19
9	$ 659.64	R$ 3.14	R$ 2,070.10	R$ 639.48
10	$ 11,360.86	R$ 3.29	R$ 37,400.49	R$ 10,139.72
				R$ 5,869.78

NPV = R$ 5,870/2.04= $ 2,877 Million

NPV is equal to NPV in dollar terms

b. Certainty Equivalent

- You are investing in a risky environmen, where your cash flow next year look as follows:
  - $100 million, with 80% probability
  - -$100 million, with 20% probability

  What is the expected cash flow?
- How much would you accept as a guaranteed alternative to this investment?
  a) $100 million
  b) $ 60 million
  c) More than $ 60 million
  d) Less than $ 60 million

Computing Certainty Equivalent cash flows right…

Step 1: Convert your expected cash flow to a certainty equivalent. There are three ways you can do this:

a. Compute certainty equivalents, using utility functions (forget this)

b. Convert your expected cash flow to a certainty equivalent

$$\text{Certainty Equivalent CF} = \frac{(1+\text{Riskfree rate})^t}{(1+\text{Risk adjusted Discount Rate})^t} E(CF_t)$$

c. Subjectively estimate a haircut to the expected cash flows

Step 2: Discount the certainty equivalent cash flows at the riskfree rate.

Rio Disney: Risk Adjusted Value
Certainty Equivalent Cash flows

CF_t* 1.035^t/1.0862^t **Discount at 3.5%**

Year	Annual Cashflow	Terminal Value	Certainty Equivalent	Present Valiue
0	-$2,000		-$2,000	-$2,000
1	-$1,000		-$953	-$921
2	-$860		-$780	-$729
3	-$270		-$234	-$211
4	$332		$274	$239
5	$453		$356	$300
6	$502		$375	$305
7	$538		$384	$302
8	$596		$405	$307
9	$660		$427	$313
10	$692	$10,669	$7,011	$4,970
				$2,877

II. Probabilistic Approaches

- The essence of risk that you are unclear about what the outcomes will be from an investment. In the risk adjusted cash flow approach, we make the adjustment by either raising discount rates or lowering cash flows.
- In probabilistic approaches, we deal with uncertainty more explicitly by
  - Asking what if questions about key inputs and looking at the impact on value (Sensitivity Analysis)
  - Looking at the cash flows/value under different scenarios for the future (Scenario Analysis)
  - Using probability distributions for key inputs, rather than expected values, and computing value as a distribution as well (Simulations)

a. Sensitivity Analysis and What-if Questions…

- The NPV, IRR and accounting returns for an investment will change as we change the values that we use for different variables.
- One way of analyzing uncertainty is to check to see how sensitive the decision measure (NPV, IRR..) is to changes in key assumptions. While this has become easier and easier to do over time, there are caveats that we would offer.

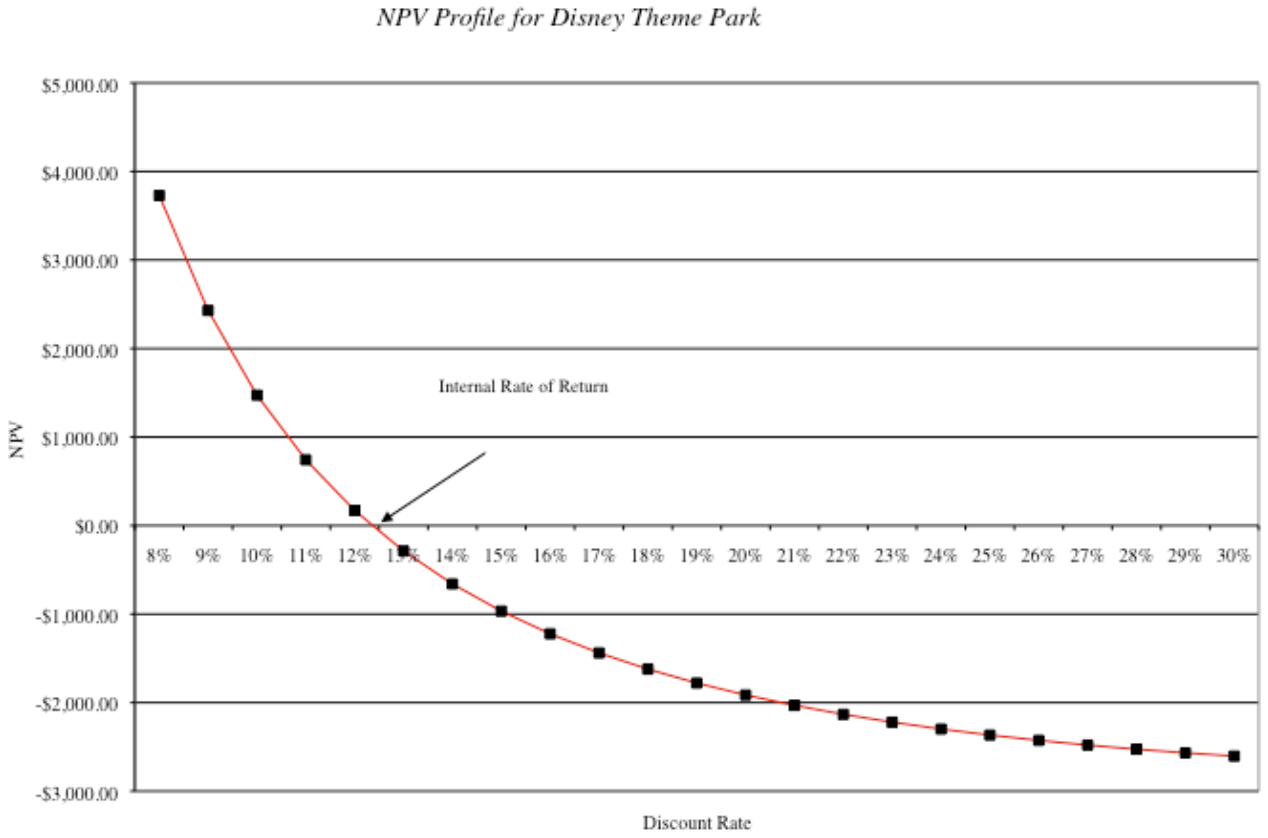
Caveat 1: When analyzing the effects of changing a variable, we often hold all else constant. In the real world, variables move together.

Caveat 2: The objective in sensitivity analysis is that we make better decisions, not churn out more tables and numbers.

Corollary 1: Less is more. Not everything is worth varying…

Corollary 2: A picture is worth a thousand numbers (and tables).

What if the cost of capital for Rio Disney were different (from 8.62%)?



b. Scenario Analysis

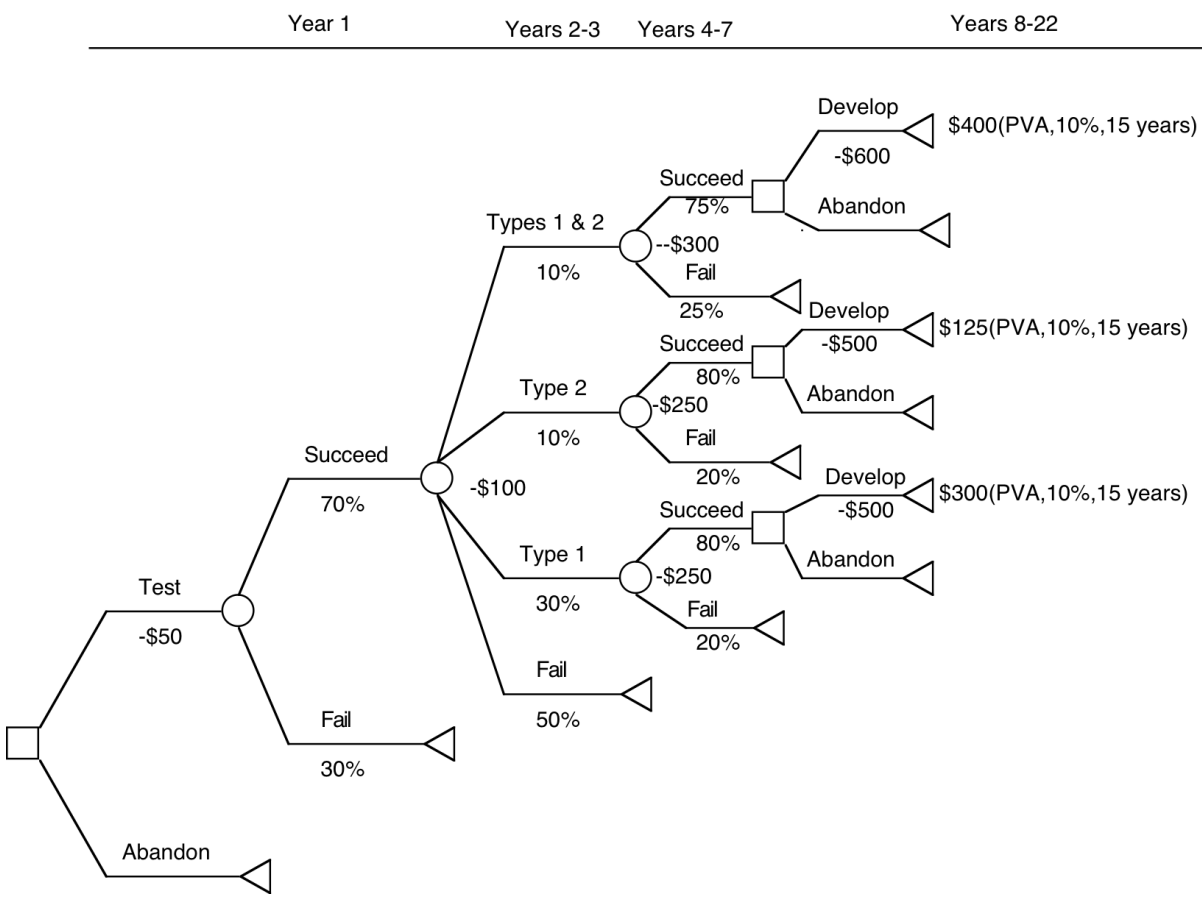
- Scenario analysis is best employed when the outcomes of a project are a function of the macro economic environment and/or competitive responses.
- As an example, assume that Boeing is considering the introduction of a new large capacity airplane, capable of carrying 650 passengers, called the *Super Jumbo*, to replace the Boeing 747. The cash flows will depend upon two major "uncontrollable" factors:
  - The growth in the long-haul, international market, relative to the domestic market. Arguably, a strong Asian economy will play a significant role in fueling this growth, since a large proportion of it will have to come from an increase in flights from Europe and North America to Asia.
  - The likelihood that Airbus, Boeing's primary competitor, will come out with a larger version of its largest capacity airplane, the A-300, over the period of the analysis.

The scenarios…

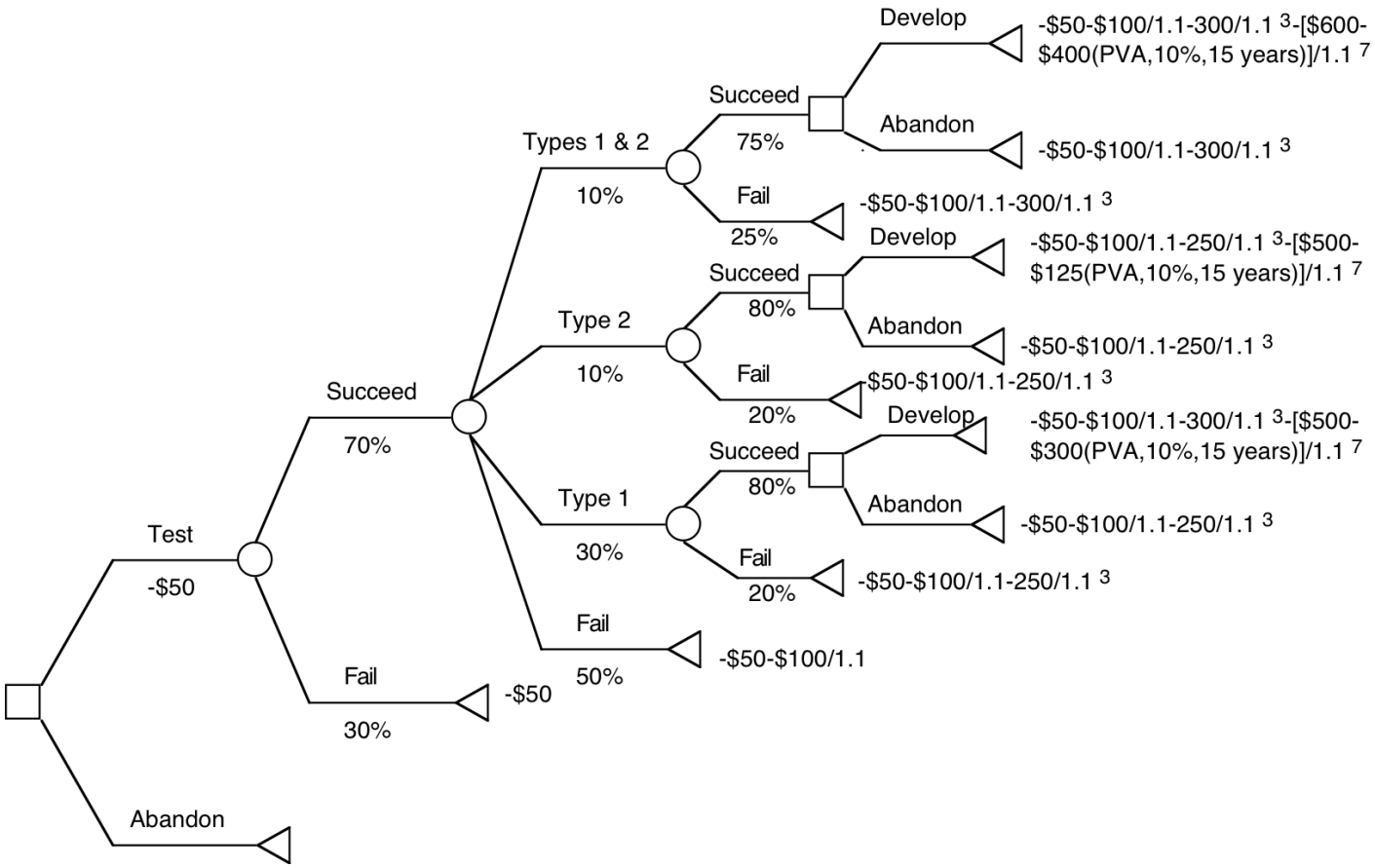
Number of planes sold under each scenario (and probability of each scenario)

	Airbus Large Jet	Airbus A-300	Airbus abandons large capacity airplane
High Growth in Asia	120 (12.5%)	150 (12.5%)	200 (0%)
Average Growth in Asia	100 (15%)	135 (25%)	160 (10%)
Low Growth in Asia	75 (5%)	110 (10%)	120 (10%)

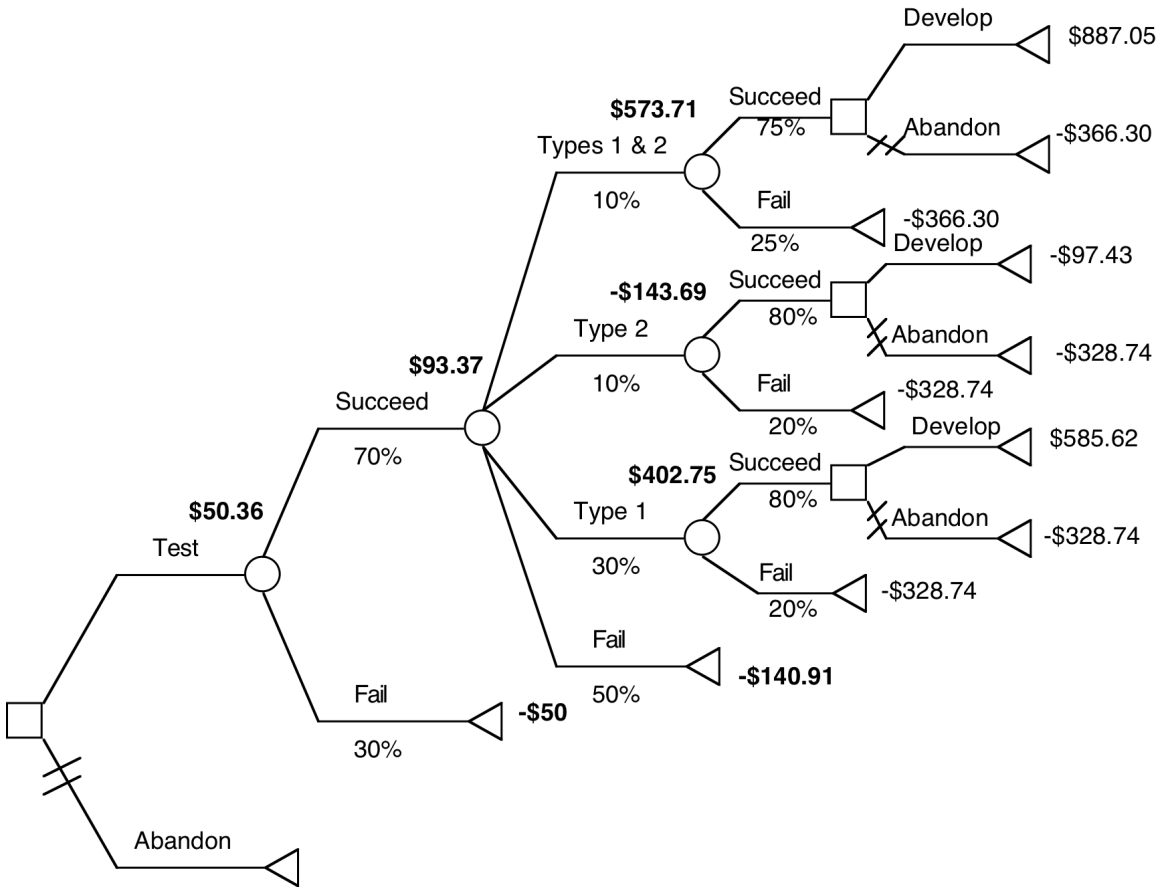
c. Decision Trees



With cash flows…



And on outcome…

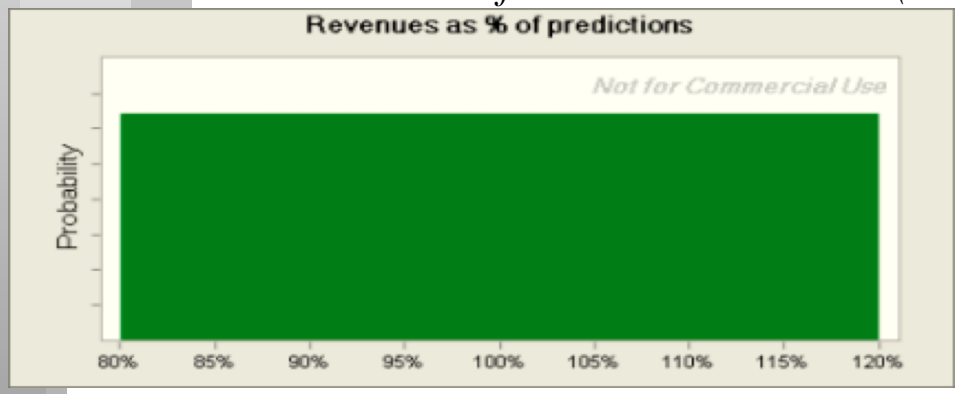


Another use for decision trees: Dealing with nationalization risk…

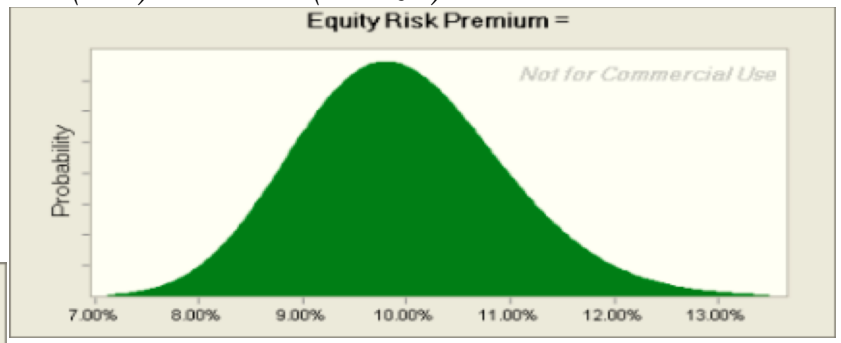
- Assume that you are valuing Gazprom, the Russian oil company and have estimated a value of US $180 billion for the operating assets. The firm has $30 billion in debt outstanding. What is the value of equity in the firm?
- Now assume that the firm has 15 billion shares outstanding. Estimate the value of equity per share.
- The Russian government owns 42% of the outstanding shares. Would that change your estimate of value of equity per share?

d. Simuations
The Disney Theme Park

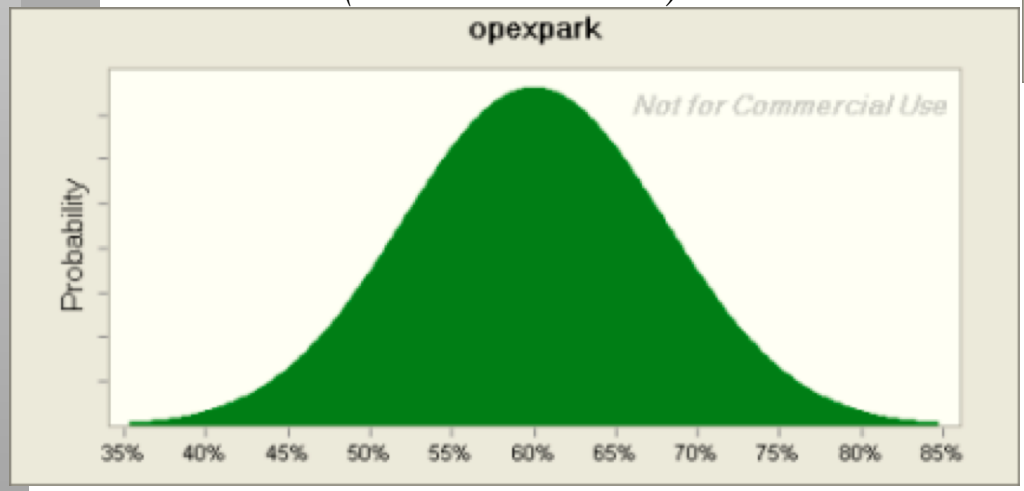
Actual Revenues as % of Forecasted Revenues (Base case = 100%)



Equity Risk Premium (Base Case = 6% (US)+ 3.95% (Brazil) = 9.95%

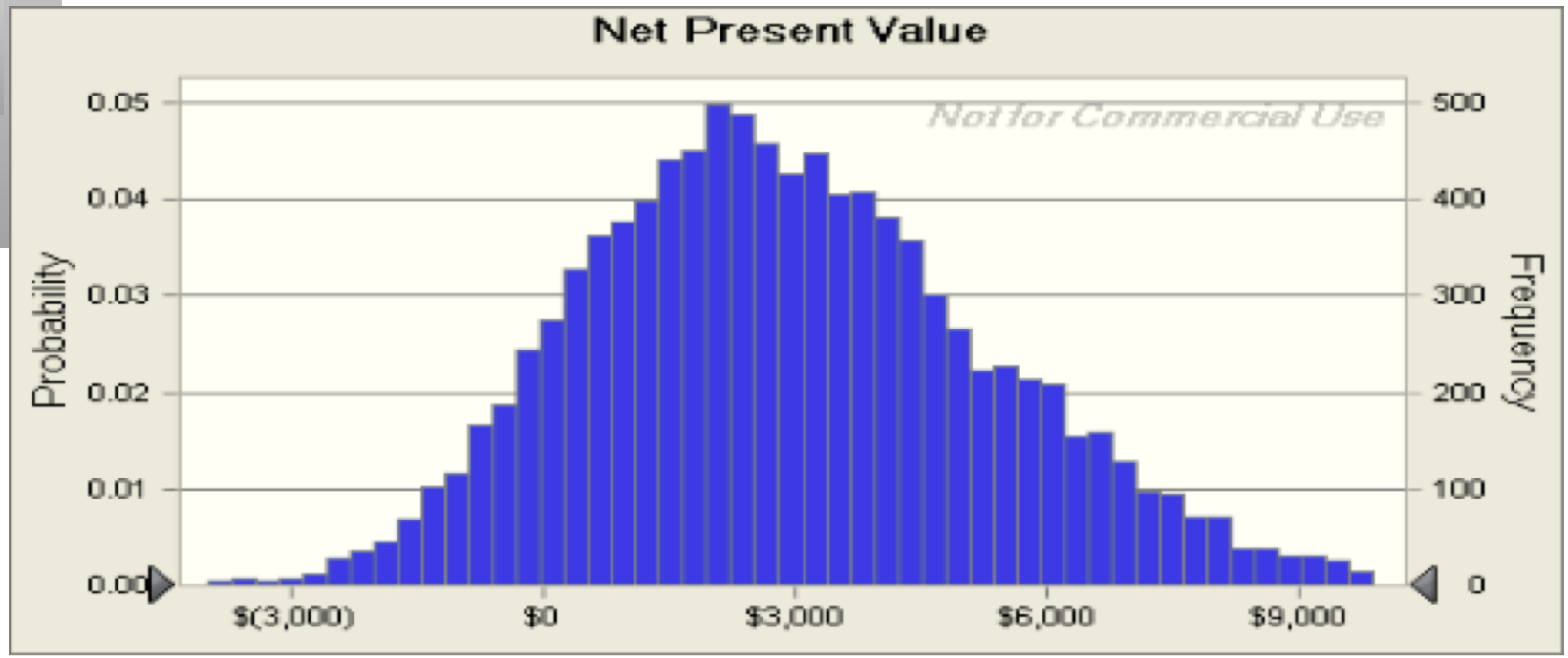


Operating Expenses at Parks as % of Revenues (Base Case = 60%)



The resulting outcome…

Average = $2.95 billion
Median = $2.73 billion



NPV ranges from -$4 billion to +$14 billion. NPV is negative 12% of the time.

Using simulations in valuation: The Exxon Mobil valuation

- You are valuing Exxon Mobil, using data from the most recent fiscal year (2008). The following provides the key numbers:

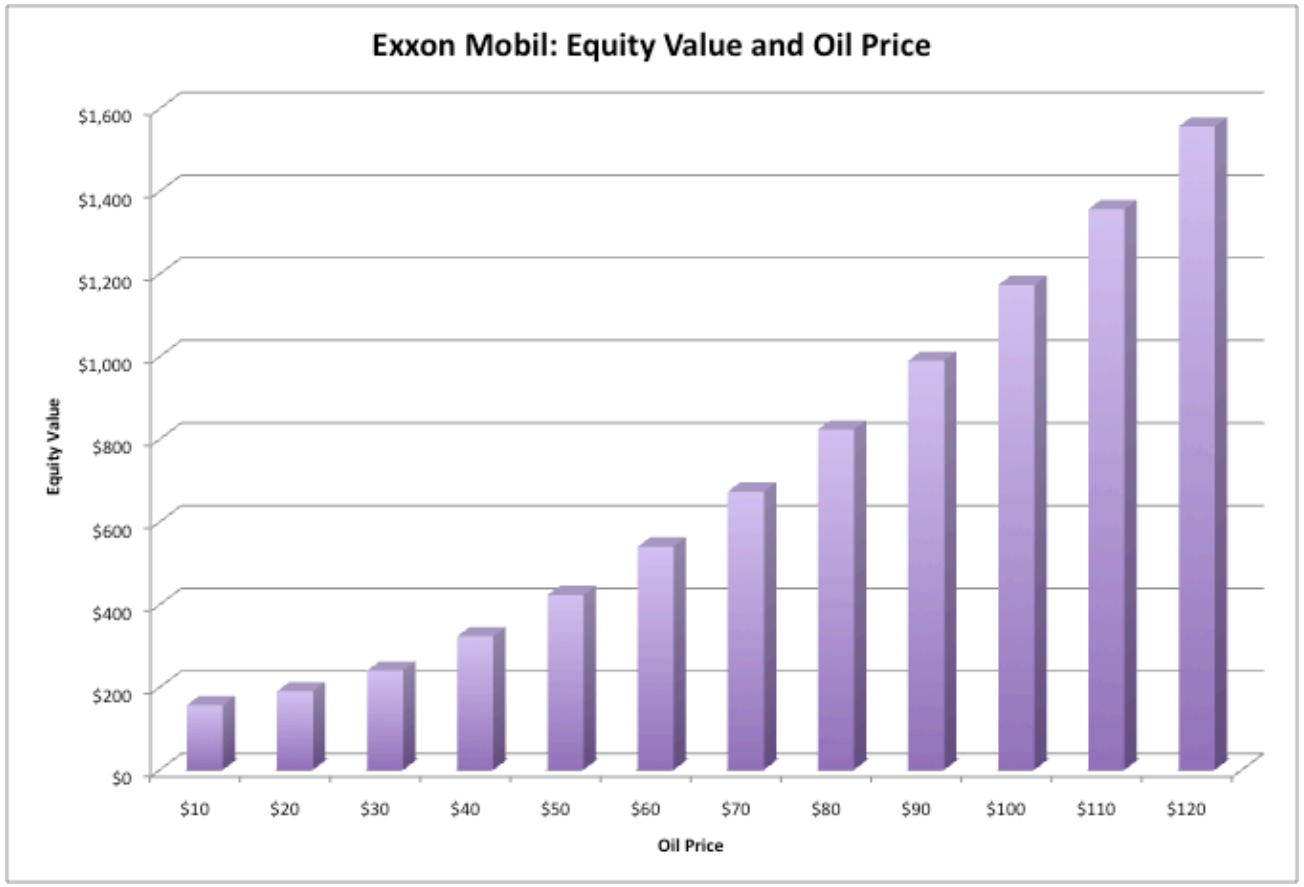
Revenues	$477 billion
EBIT (1-t)	$ 58 billion
Net Cap Ex	$ 3 billion
Chg WC	$ 1 billion
FCFF	$ 54 billion

- The cost of capital for the firm is 8% and you use a very conservative stable growth rate of 2% to value the firm. The market cap for the firm is $330 billion and it has $ 10 billion in debt outstanding.

  a. How under or over valued is the equity in the firm?

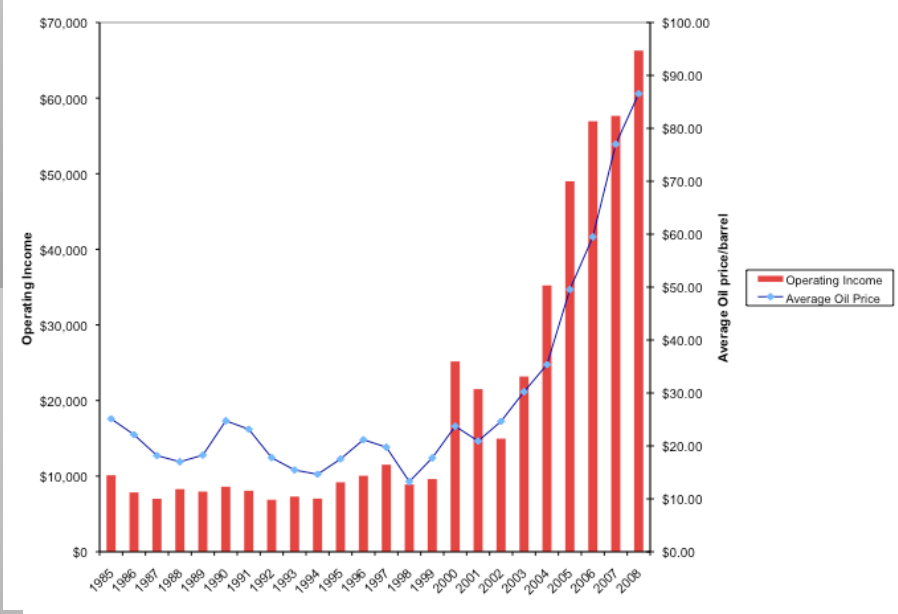
  b. Would you buy the stock based on this valuation? Why or why not?

Normalization… not easy to do… but you don't have a choice…



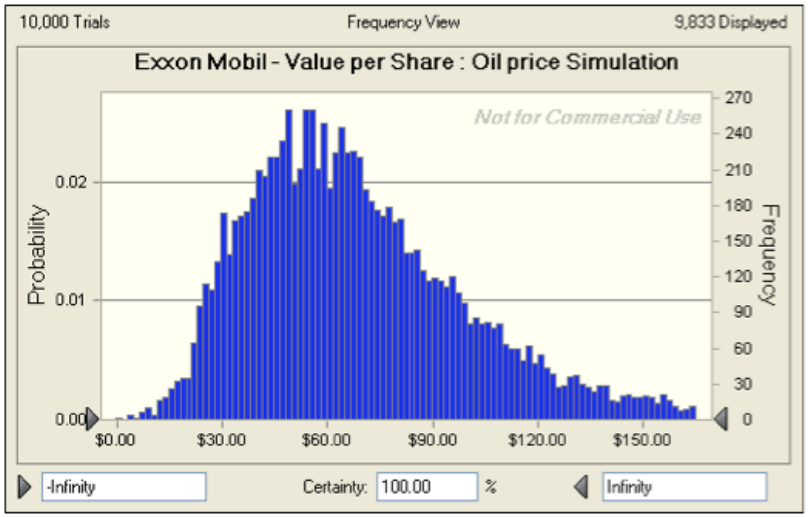
And one possible response…

Step 1: Look at history



Step 2: Look for relationship
Regression of Exxon income against oil price
Op Inc = -6,934 + 911 (Price per barrel of oil)
R squared = 94%

Step 3: Run simulation



Choosing a Probabilistic Approach

Discrete/Continuous	*Correlated/Independent*	*Sequential/Concurrent*	*Risk Approach*
Discrete	Independent	Sequential	Decision Tree
Discrete	Correlated	Concurrent	Scenario Analysis
Continuous	Either	Either	Simulations

III. Value at Risk (VaR)

- Value at Risk measures the potential loss in value of a risky asset or portfolio over a defined period for a given confidence interval. Thus, if the VaR on an asset is $ 100 million at a one-week, 95% confidence level, there is a only a 5% chance that the value of the asset will drop more than $ 100 million over any given week.
- There are three key elements of VaR – a specified level of loss in value, a fixed time period over which risk is assessed and a confidence interval. The VaR can be specified for an individual asset, a portfolio of assets or for an entire firm
- VaR has been used most widely at financial service firms, where the risk profile is constantly shifting and a big loss over a short period can be catastrophic (partly because the firms have relatively small equity, relative to the bets that they make, and partly because of regulatory constraints)

Key Ingredients in VaR

- To estimate the probability of the loss, with a confidence interval, we need to
  a. Define the probability distributions of individual risks,
  b. Estimate the correlation across these risks and
  c. Evaluate the effect of such risks on value.
- The focus in VaR is clearly on downside risk and potential losses. Its use in banks reflects their fear of a liquidity crisis, where a low-probability catastrophic occurrence creates a loss that wipes out the capital and creates a client exodus. .

VaR Approaches

I. Variance Covariance Matrix: If we can estimate how each asset moves over time (variance) and how it moves with every other asset (covariance), we can mathematically estimate the VaR.

   Weakness: The variances and covariances are usually estimated using historical data and are notoriously unstable (especially covariances_

II. Historical data simulation: If we know how an asset or portfolio has behaved in the past, we can use the historical data to make judgments of VaR.

   Weakness: The past may not be a good indicator of the future.

III. Monte Carlo Simulation: If we can specify return distributions for each asset/portfolio, we can run simulations to determine VaR.

   Weakness: Garbage in, garbage out. A simulation is only as good as the distributions that go into it.

Limitations of VaR

- Focus is too narrow: The focus on VaR is very narrow. For instance, consider a firm that wants to ensure that it does not lose more than $ 100 million in a month and uses VaR to ensure that this happens. Even if the VaR is estimated correctly, the ensuing decisions may not be optimal or even sensible.
- The VaR can be wrong: No matter which approach you use to estimate VaR, it remains an estimate and can be wrong. Put another way, there is a standard error in the VaR estimate that is large.
- The Black Swan: VaR approaches, no matter how you frame them, have their roots in the past. As long as markets are mean reverting and stay close to historical norms, VaR will work. If there is a structural break, VaR may provide little or no protection against calamity.

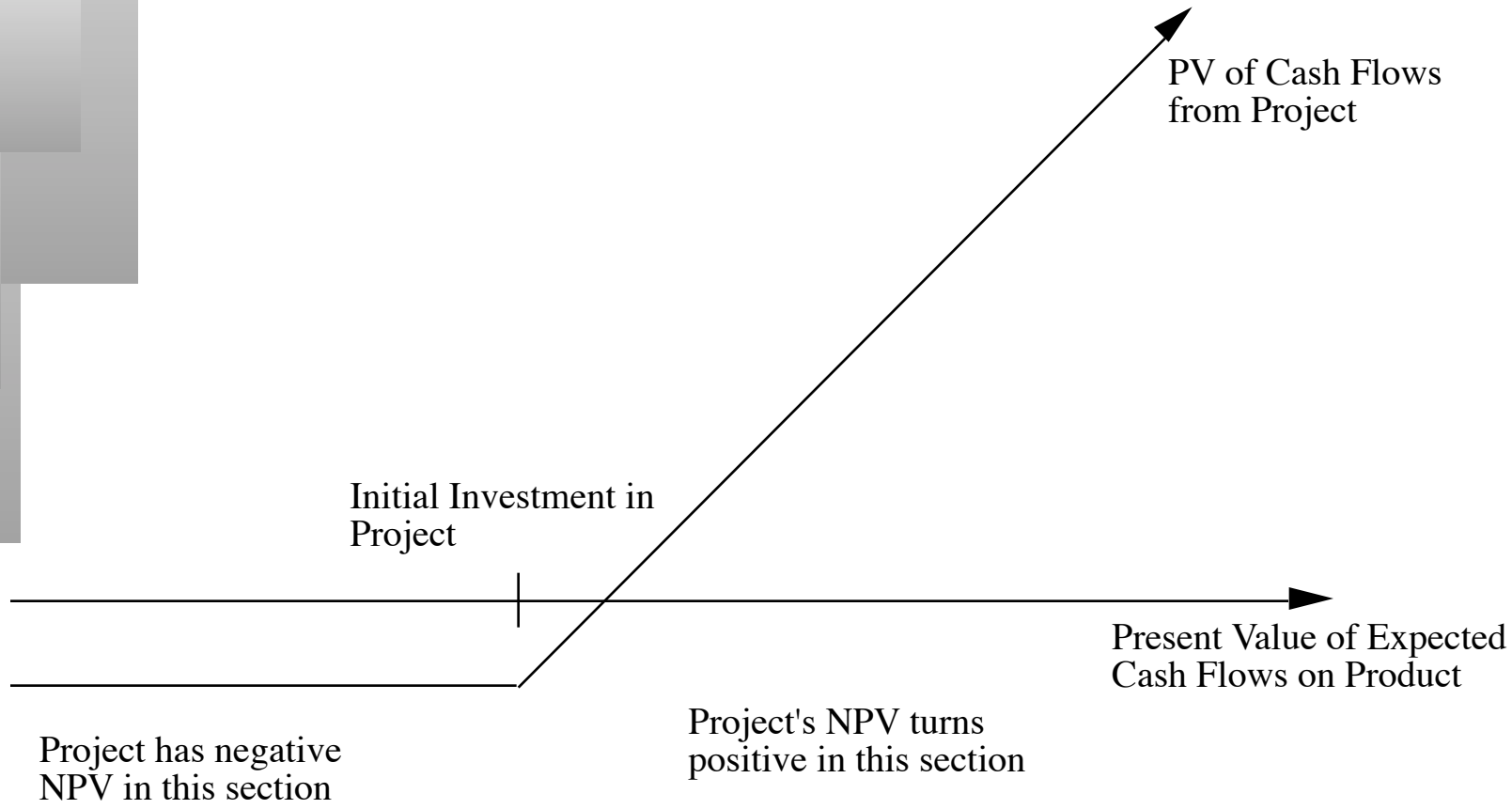
IV. Real Options

- One of the limitations of traditional investment analysis is that it is static and does not do a good job of capturing the options embedded in investment.
  - The first of these options is the option to delay taking a project, when a firm has exclusive rights to it, until a later date.
  - The second of these options is taking one project may allow us to take advantage of other opportunities (projects) in the future
  - The last option that is embedded in projects is the option to abandon a project, if the cash flows do not measure up.
- Unlike other risk adjustment approaches in finance, which tend to just penalize investments for risk, real options explicitly brings in the upside of risk into the analysis.

The Option to Delay

- When a firm has exclusive rights to a project or product for a specific period, it can delay taking this project or product until a later date.
- A traditional investment analysis just answers the question of whether the project is a "good" one if taken today.
- Thus, the fact that a project does not pass muster today (because its NPV is negative, or its IRR is less than its hurdle rate) does not mean that the rights to this project are not valuable.

Valuing the Option to Delay a Project



An example: A Pharmaceutical patent

- Assume that a pharmaceutical company has been approached by an entrepreneur who has patented a new drug to treat ulcers. The entrepreneur has obtained FDA approval and has the patent rights for the next 17 years.
- While the drug shows promise, it is still very expensive to manufacture and has a relatively small market. Assume that the initial investment to produce the drug is $ 500 million and the present value of the cash flows from introducing the drug now is only $ 350 million.
- The technology and the market is volatile, and the annualized standard deviation in the present value, estimated from a simulation is 25%.

Valuing the Patent

- Inputs to the option pricing model
  - Value of the Underlying Asset (S) = PV of Cash Flows from Project if introduced now = $ 350 million
  - Strike Price (K) = Initial Investment needed to introduce the product = $ 500 million
  - Variance in Underlying Asset's Value = $(0.25)^2 = 0.0625$
  - Time to expiration = Life of the patent = 17 years
  - Dividend Yield = 1/Life of the patent = 1/17 = 5.88% (Every year you delay, you lose 1 year of protection)
  - Assume that the 17-year riskless rate is 4%. The value of the option can be estimated as follows:
- Call Value= $350\ exp^{(-0.0588)(17)}\ (0.5285) - 500\ (exp^{(-0.04)(17)}\ (0.1219) =$ $ 37.12 million

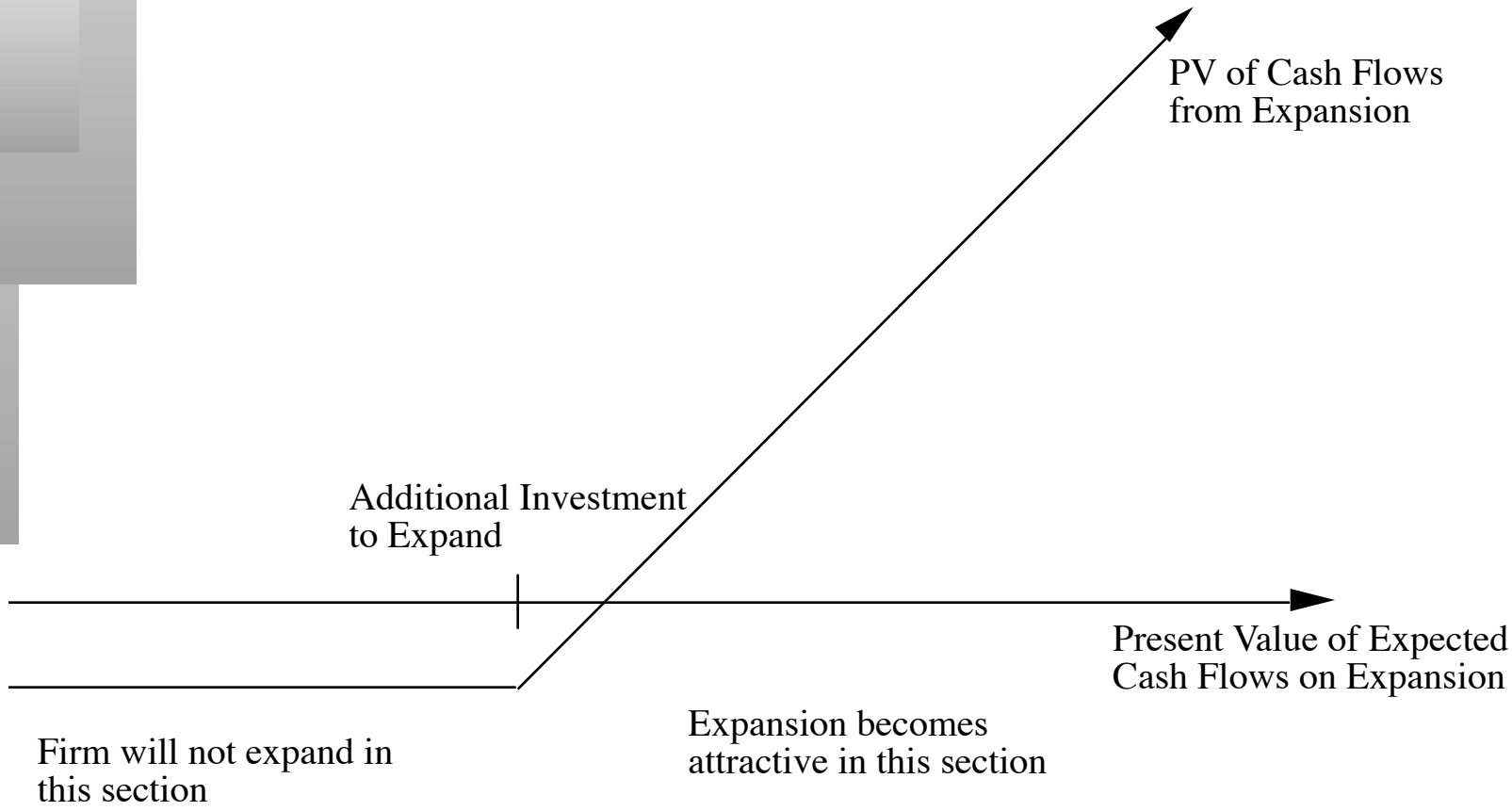
Insights for Investment Analyses

- Having the exclusive rights to a product or project is valuable, even if the product or project is not viable today.
- The value of these rights increases with the volatility of the underlying business.
- The cost of acquiring these rights (by buying them or spending money on development - R&D, for instance) has to be weighed off against these benefits.

The Option to Expand/Take Other Projects

- Taking a project today may allow a firm to consider and take other valuable projects in the future.
- Thus, even though a project may have a negative NPV, it may be a project worth taking if the option it provides the firm (to take other projects in the future) has a more-than-compensating value.
- These are the options that firms often call "strategic options" and use as a rationale for taking on "negative NPV" or even "negative return" projects.

The Option to Expand



An Example of an Expansion Option

- Disney is considering investing $ 100 million to create a Spanish version of the Disney channel to serve the growing Mexican market.
- A financial analysis of the cash flows from this investment suggests that the present value of the cash flows from this investment to Disney will be only $ 80 million. Thus, by itself, the new channel has a **negative NPV of $ 20 million**.
- If the market in Mexico turns out to be more lucrative than currently anticipated, Disney **could expand** its reach to all of Latin America with **an additional investment of $ 150 million** any time over the next 10 years. While the current expectation is that the cash flows from having a Disney channel in Latin America is only $ 100 million, there is considerable uncertainty about both the potential for such an channel and the shape of the market itself, leading to significant variance in this estimate.

Valuing the Expansion Option

- Value of the Underlying Asset (S) = PV of Cash Flows from Expansion to Latin America, if done now =$ 100 Million
- Strike Price (K) = Cost of Expansion into Latin American = $ 150 Million
- We estimate the variance in the estimate of the project value by using the annualized standard deviation in firm value of publicly traded entertainment firms in the Latin American markets, which is approximately 30%.
  - Variance in Underlying Asset's Value = $0.30^2 = 0.09$
- Time to expiration = Period of expansion option = 10 years
- Riskless Rate = 4%

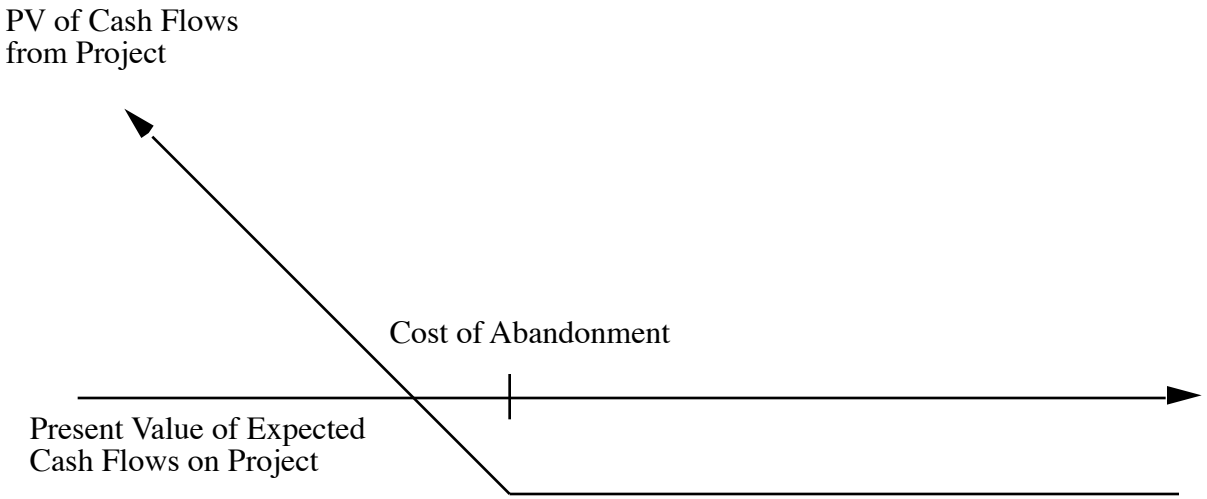
Call Value= $ 36.3 Million

Considering the Project with Expansion Option

- NPV of Disney Channel in Mexico = $ 80 Million - $ 100 Million = - $ 20 Million
- Value of Option to Expand = $ 36.3 Million
- NPV of Project with option to expand
  = - $ 20 million + $ 36.3 million
  = $ 16.3 million
- **Take the first investment, with the option to expand.**

The Option to Abandon

- A firm may sometimes have the option to abandon a project, if the cash flows do not measure up to expectations.
- If abandoning the project allows the firm to save itself from further losses, this option can make a project more valuable.



Valuing the Option to Abandon

- Disney is considering taking a 25-year project which
  - requires an initial investment of $ 255 million in an real estate partnership to develop time share properties with a South Florida real estate developer,
  - has a present value of expected cash flows is $ 254 million.
- While the net present value is negative, assume that Disney has the option to abandon this project anytime by selling its share back to the developer in the next 5 years for $ 150 million.
- A simulation of the cash flows on this time share investment yields a variance in the present value of the cash flows from being in the partnership is 0.04.

Project with Option to Abandon

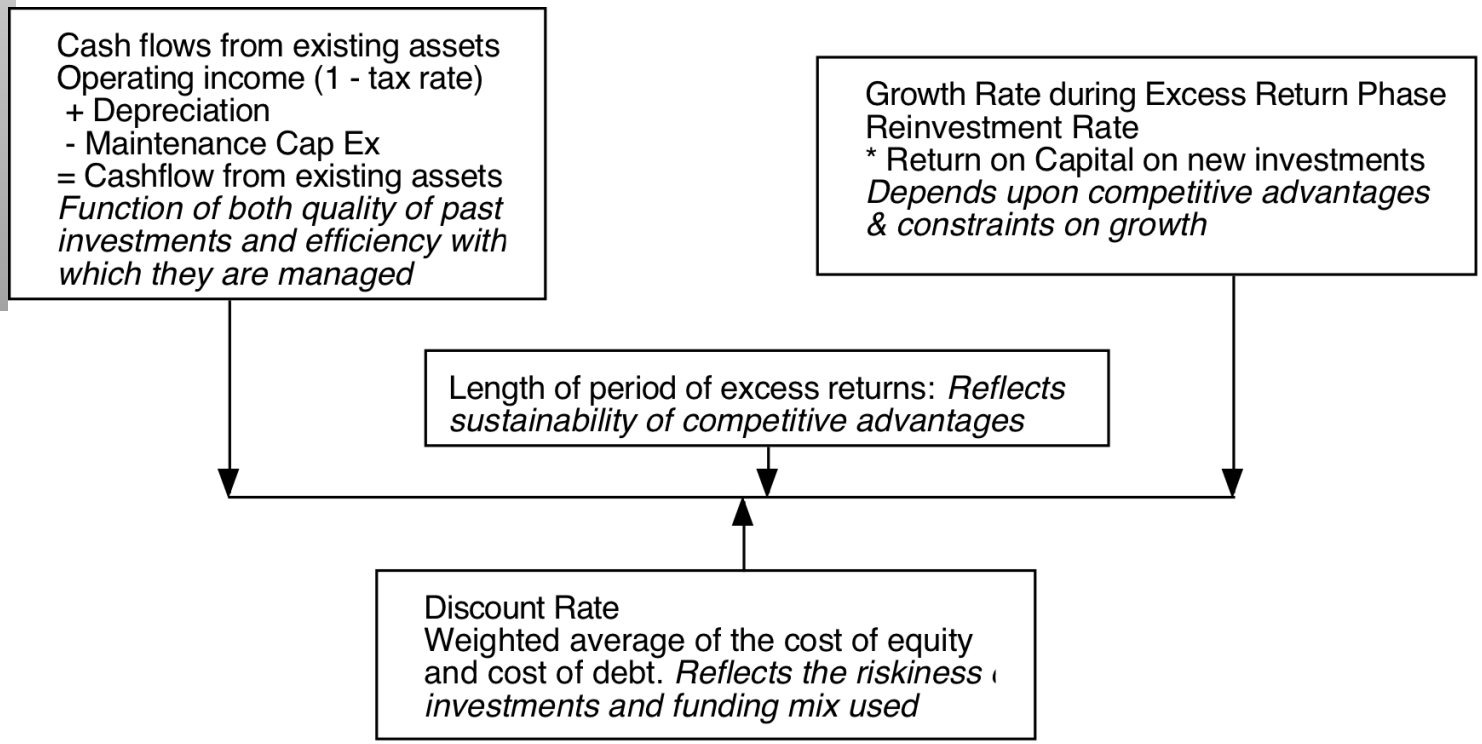
- Value of the Underlying Asset (S) = PV of Cash Flows from Project
  = $ 254 million
- Strike Price (K) = Salvage Value from Abandonment = $ 150 million
- Variance in Underlying Asset's Value = 0.04
- Time to expiration = Abandonment period =5 years
- Dividend Yield = 1/Life of the Project = 1/25 = 0.04 (We are assuming that the project's present value will drop by roughly 1/n each year into the project)
- Assume that the five-year riskless rate is 4%.

Should Disney take this project?

- Call Value = 254 $\exp^{(0.04)(5)}$ (0.9194) -150 ($\exp^{(-0.04)(5)}$ (0.8300)
  = $ 89.27 million
- Put Value= $ 89.27 - 254 $\exp^{(0.04)(5)}$ +150 ($\exp^{(-0.04)(5)}$ = $ 4.13 million
- The value of this abandonment option has to be added on to the net present value of the project of -$ 1 million, yielding a total net present value with the abandonment option of $ 3.13 million.

How do we manage risk?

Determinants of Value



When Risk Hedging/Management Matters..

- For an action to affect value, it has to affect one or more of the following inputs into value:
  - Cash flows from existing assets
  - Growth rate during excess return phase
  - Length of period of excess returns
  - Discount rate

Proposition 1: Risk hedging/management can increase value only if they affect cash flows, growth rates, discount rates and/or length of the growth period.

Proposition 2: When risk hedging/management has no effect on cash flows, growth rates, discount rates and/or length of the growth period, it can have no effect on value.

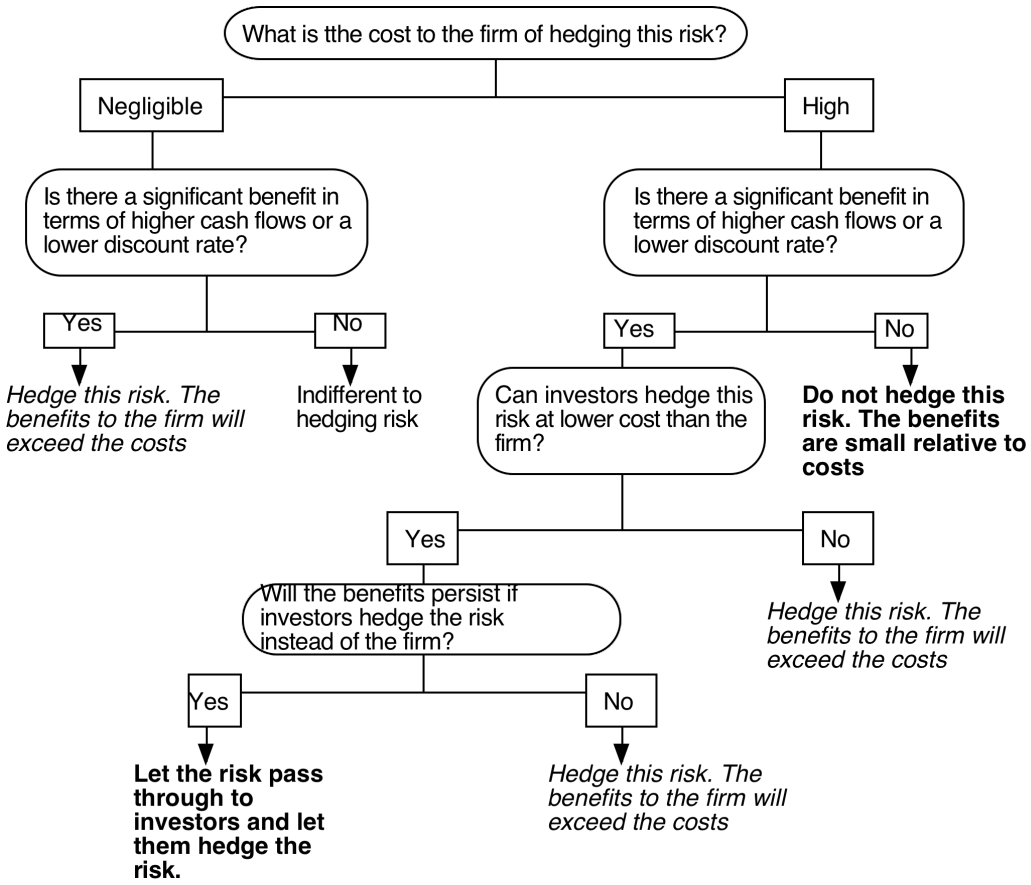
Risk Hedging/ Management and Value

Valuation Component	*Effect of Risk Hedging*	*Effect of Risk Management*
Costs of equity and capital	Reduce cost of equity for private and closely held firms. Reduce cost of debt for heavily levered firms with significant distress risk	May increase costs of equity and capital, if a firm increases its exposure to risks where it feels it has a differential advantage.
Cash flow to the Firm	Cost of risk hedging will reduce earnings. Smoothing out earnings may reduce taxes paid over time.	More effective risk management may increase operating margins and increase cash flows.
Expected Growth rate during high growth period	Reducing risk exposure may make managers more comfortable taking risky (and good) investments. Increase in reinvestment rate will increase growth.	Exploiting opportunities created by risk will allow the firm to earn a higher return on capital on its new investments.
Length of high growth period	No effect	Strategic risk management can be a long-term competitive advantage and increase length of growth period.

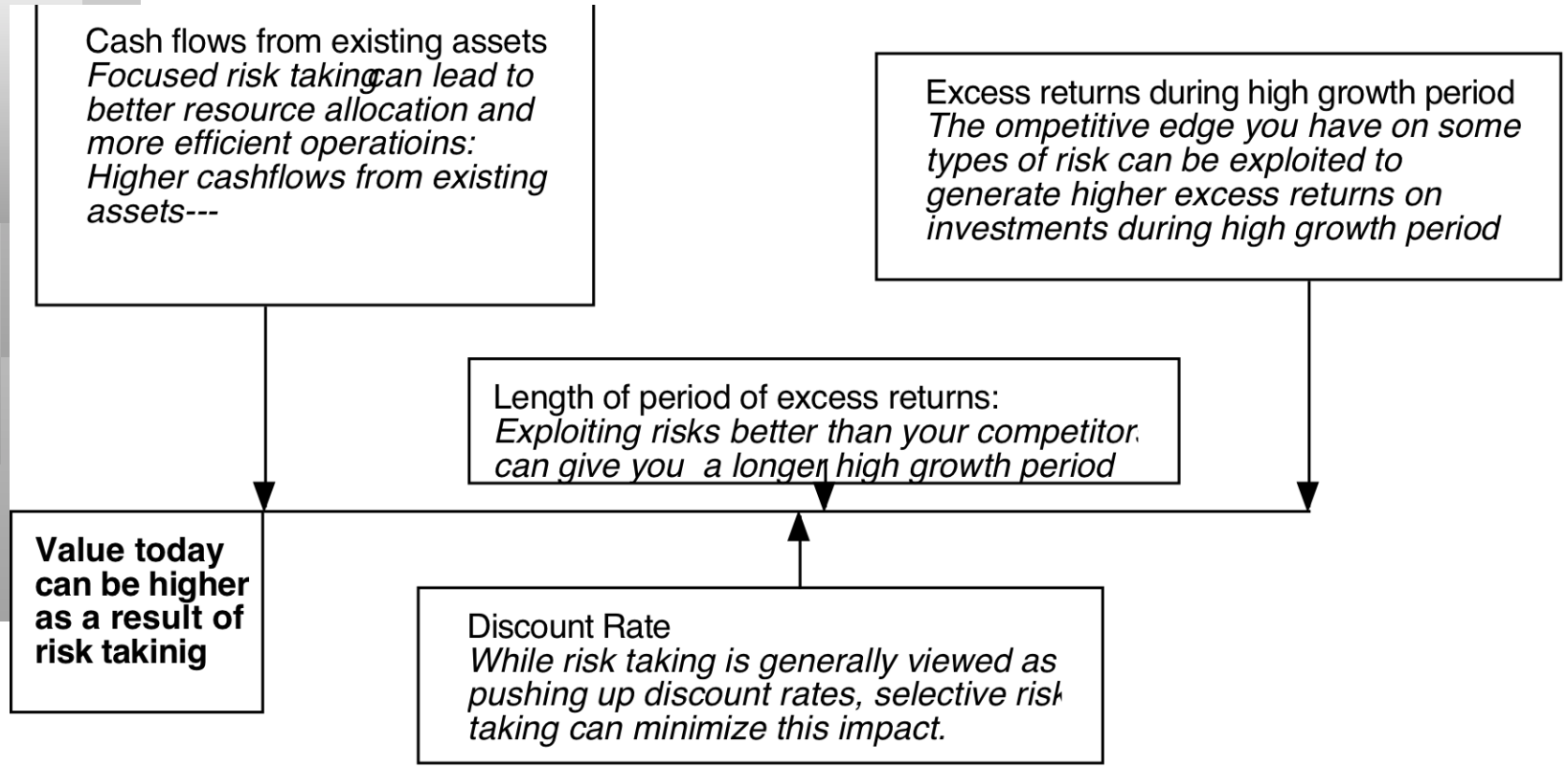
Does hedging affect value?

- Studies that examine whether hedging increase value range from finding marginal gains to mild losses.
  - Smithson presents evidence that he argues is consistent with the notion that risk management increases value, but the increase in value at firms that hedge is small and not statistically significant.
  - Mian finds only weak or mixed evidence of the potential hedging benefits– lower taxes and distress costs or better investment decisions. In fact, the evidence in inconsistent with a distress cost model, since the companies with the greatest distress costs hedge the least.
  - Tufano's study of gold mining companies finds little support for the proposition that hedging is driven by the value enhancement
- In summary, the benefits of hedging are hazy at best and non-existent at worst, when we look at publicly traded firms. A reasonable case can be made that most hedging can be attributed to managerial interests being served rather than increasing stockholder value.

A framework for risk hedging..



b. Risk Taking: Effect on Value



How do you exploit risk?

- To exploit risk better than your competitors, you need to bring something to the table. In particular, there are five possible advantages that successful risk taking firms exploit:

a. Information Advantage: In a crisis, getting better information (and getting it early) can allow be a huge benefit.

b. Speed Advantage: Being able to act quickly (and appropriately) can allow a firm to exploit opportunities that open up in the midst of risk.

c. Experience/Knowledge Advantage: Firms (and managers) who have been through similar crises in the past can use what they have learned.

d. Resource Advantage: Having superior resources can allow a firm to withstand a crisis that devastates its competition.

e. Flexibility: Building in the capacity to change course quickly can be an advantage when faced with risk.