

# Corporate Finance

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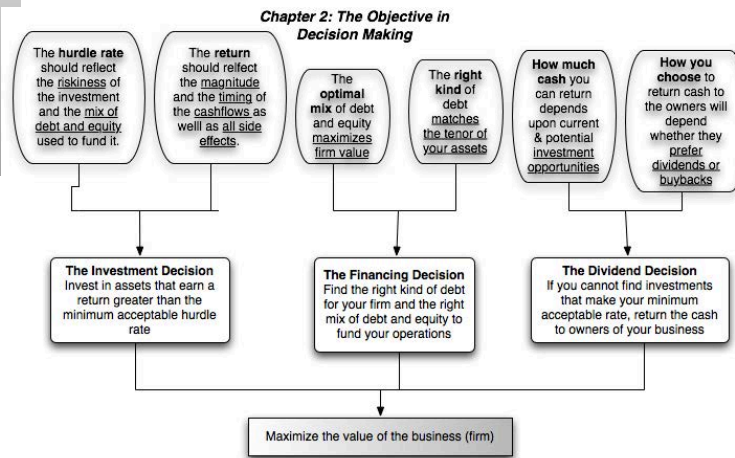
*Lecture Note: Packet 1*

Aswath Damodaran

## The Objective in Corporate Finance

“If you don't know where you are going, it does not matter how you get there”

## First Principles

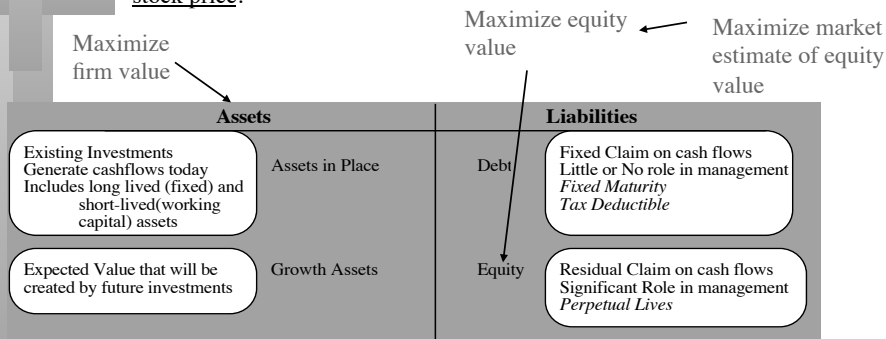


## The Classical Viewpoint

- **Van Horne:** "In this book, we assume that the objective of the firm is to maximize its value to its stockholders"
- **Brealey & Myers:** "Success is usually judged by value: Shareholders are made better off by any decision which increases the value of their stake in the firm... The secret of success in financial management is to increase value."
- **Copeland & Weston:** The most important theme is that the objective of the firm is to maximize the wealth of its stockholders."
- **Brigham and Gapenski:** Throughout this book we operate on the assumption that the management's primary goal is stockholder wealth maximization which translates into maximizing the price of the common stock.

## The Objective in Decision Making

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



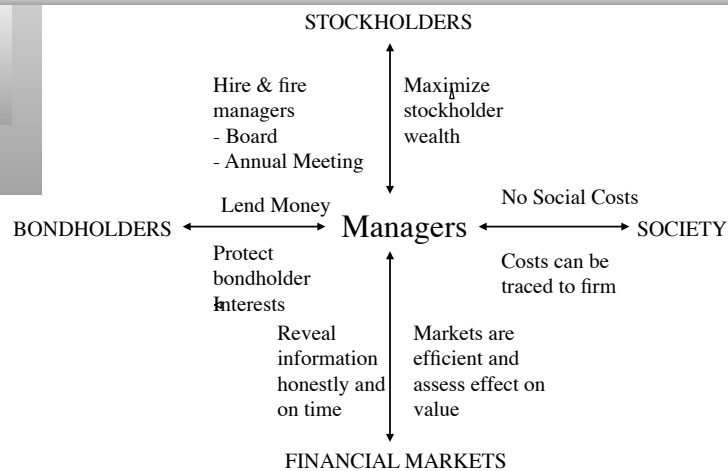
## Maximizing Stock Prices is too “narrow” an objective: A preliminary response

- Maximizing stock price is not incompatible with meeting employee needs/objectives. In particular:
  - - Employees are often stockholders in many firms
  - - Firms that maximize stock price generally are profitable firms that can afford to treat employees well.
- Maximizing stock price does not mean that customers are not critical to success. In most businesses, keeping customers happy is the route to stock price maximization.
- Maximizing stock price does not imply that a company has to be a social outlaw.

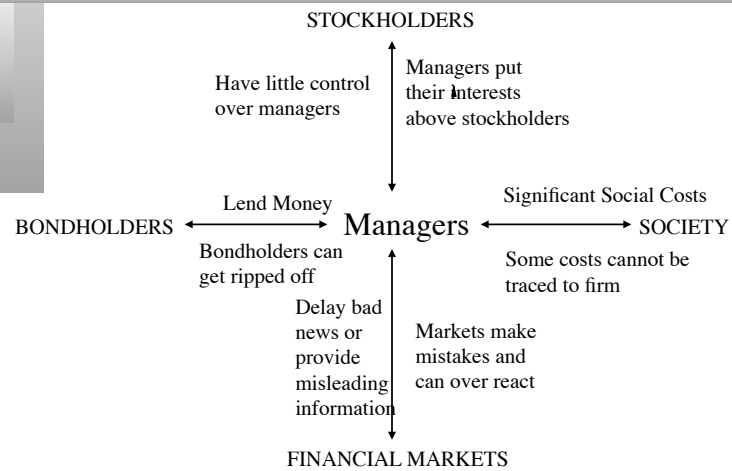
## Why traditional corporate financial theory focuses on maximizing stockholder wealth.

- Stock price is easily observable and constantly updated (unlike other measures of performance, which may not be as easily observable, and certainly not updated as frequently).
- If investors are rational (are they?), stock prices reflect the wisdom of decisions, short term and long term, instantaneously.
- The objective of stock price performance provides some very elegant theory on:
  - Allocating resources across scarce uses (which investments to take and which ones to reject)
  - how to finance these investments
  - how much to pay in dividends

## The Classical Objective Function



## What can go wrong?



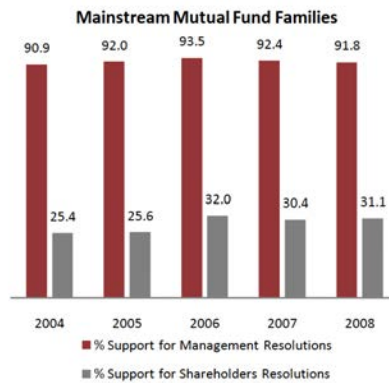
## I. Stockholder Interests vs. Management Interests

- **In theory:** The stockholders have significant control over management. The mechanisms for disciplining management are the annual meeting and the board of directors.
- **In Practice:** Neither mechanism is as effective in disciplining management as theory posits.

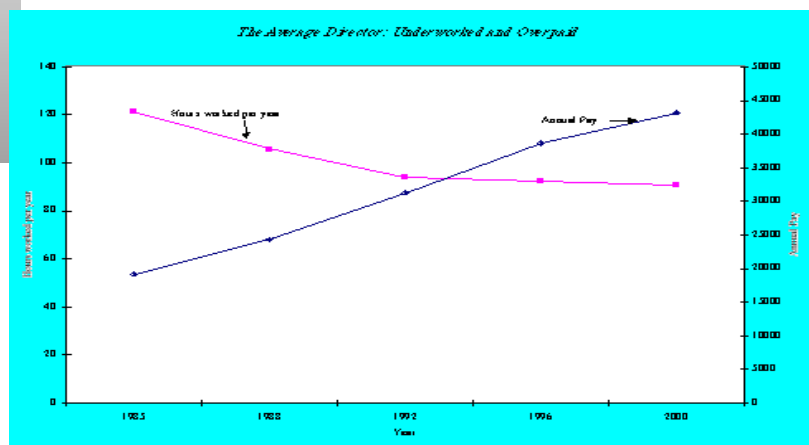
## The Annual Meeting as a disciplinary venue

- The power of stockholders to act at annual meetings is diluted by three factors
  - Most small stockholders do not go to meetings because the cost of going to the meeting exceeds the value of their holdings.
  - Incumbent management starts off with a clear advantage when it comes to the exercise of proxies. Proxies that are not voted becomes votes for incumbent management.
  - For large stockholders, the path of least resistance, when confronted by managers that they do not like, is to vote with their feet.

## And institutional investors go along with incumbent managers...



## Board of Directors as a disciplinary mechanism



## The CEO often hand-picks directors..

- A 1992 survey by Korn/Ferry revealed that 74% of companies relied on recommendations from the CEO to come up with new directors; Only 16% used an outside search firm. While that number has changed in recent years, CEOs still determine who sits on their boards. While more companies have outsiders involved in picking directors now, CEOs still exercise significant influence over the process.
- Directors often hold only token stakes in their companies. The Korn/Ferry survey found that 5% of all directors in 1992 owned less than five shares in their firms. Most directors in companies today still receive more compensation as directors than they gain from their stockholdings. While share ownership is up among directors today, they usually get these shares from the firm (rather than buy them).
- Many directors are themselves CEOs of other firms. Worse still, there are cases where CEOs sit on each other's boards.

## Directors lack the expertise (and the willingness) to ask the necessary tough questions..

- In most boards, the CEO continues to be the chair. Not surprisingly, the CEO sets the agenda, chairs the meeting and controls the information provided to directors.
- The search for consensus overwhelms any attempts at confrontation.

## Who's on Board? The Disney Experience - 1997

<b>Revela F. Bowers 1,5</b> Head of School Center for Early Education	<b>Leo J. O'Donovan, S.J.</b> President Georgetown University
<b>Roy E. Disney 3</b> Vice Chairman The Walt Disney Company	<b>Michael S. Ovitz 3</b> President The Walt Disney Company
<b>Michael D. Eisner 3</b> Chairman and Chief Executive Officer The Walt Disney Company	<b>Sidney Pottier 2,4</b> Chief Executive Officer Verdon-Cedric Productions
<b>Stanley P. Gold 4,5</b> President and Chief Executive Officer Shamrock Holdings, Inc.	<b>Irwin E. Russell 2,4</b> Attorney at Law
<b>Sanford M. Litvack</b> Senior Executive Vice President and Chief of Corporate Operations The Walt Disney Company	<b>Robert A. M. Stern</b> Senior Partner Productions
<b>Ignacio E. Lozano, Jr. 1,2,4</b> Editor-in-Chief, LA OPINION	<b>E. Cardon Walker 1</b> Former Chairman and Chief Executive Officer The Walt Disney Company
<b>George J. Mitchell 5</b> Special Counsel Verner, Lippert, Bernard, McPherson and Hand	<b>Raymond L. Watson 1,2,3</b> Vice Chairman The Irvine Company
<b>Thomas S. Murphy</b> Former Chairman Capitol Cities/ABC, Inc.	<b>Gary L. Wilson 5</b> Co-Chairman Northwest Airlines Corporation
<b>Richard A. Nunis</b> Chairman Walt Disney Attractions	1 Member of Audit Review Committee 2 Member of Compensation Committee 3 Member of Executive Committee 4 Member of Executive Performance Plan Committee 5 Member of Nominating Committee



## The Calpers Tests for Independent Boards

- Calpers, the California Employees Pension fund, suggested three tests in 1997 of an independent board
  - Are a majority of the directors outside directors?
  - Is the chairman of the board independent of the company (and not the CEO of the company)?
  - Are the compensation and audit committees composed entirely of outsiders?
- Disney was the only S&P 500 company to fail all three tests.

## Business Week piles on... The Worst Boards in 1997..

EW RANK	OVERALL SCORE	S&P500 SCORE	ANALYSIS SCORE	DETAILS	BOARD PERFORMANCE POLL				GOVERNANCE GUIDELINE ANALYSIS		
					SHAREHOLDER ACCOUNTABILITY	BOARD QUALITY	BOARD INDEPENDENCE	CORPORATE PERFORMANCE	SHAREHOLDER ACCOUNTABILITY	BOARD QUALITY	BOARD INDEPENDENCE
1. DISNEY	10.3	1.8	8.5	Investors decry board for conflicts: many directors own little if any stock	3.3	4.3	2.0	5.8	-0.4	2.8	2.2
2. AT&T	10.9	-16.6	27.5	Investors scorn board for failing to control succession, not ousting CEO	3.0	4.2	3.5	2.8	2.0	5.2	7.4
3. W.J. HEINZ	15.4	-1.1	16.5	LongTime CEO dominates insider-filled board, resists investor calls for change	2.8	3.7	2.0	4.7	4.4	6.0	1.4
4. ARCHER DANIELS MIDLAND	16.8	-12.2	29.0	Board changes fail to satisfy investors, who say directors still lack independence	2.3	2.1	1.3	3.5	5.6	7.6	5.0
5. DOW JONES	21.1	1.6	19.5	Investors disenchanted with performance; weakest attendance record of any board	2.6	4.6	2.8	2.6	6.0	0.0	5.8
6. BILLARD'S	22.0	5.0	17.0	Board loaded with insiders, lacks an outsider with retail expertise or CEO	2.0	3.0	2.0	3.5	6.4	3.2	2.0
7. ROLLINS INTERNATIONAL	22.7	1.7	21.0	Board dominated by family members and insiders; lacks nominating panel	1.0	1.0	0.0	2.0	4.0	7.6	4.4
8. OCCIDENTAL PETROLEUM	24.0	-1.5	25.5	Investors outraged over \$95 million payout to CEO by cozy, tame board	1.3	2.0	1.1	2.0	2.8	6.0	5.8
9. OGDEN	27.2	4.2	23.0	Board has three consultants and a lawyer who do business with company	2.0	1.5	2.0	2.5	2.0	8.4	4.0
10. MAXXAM	28.3	4.3	24.5	Tiny board with little business experience dominated by CEO	1.5	2.0	1.0	3.5	3.6	2.0	6.0

## ⌘ Application Test: Who's on board?

- Look at the board of directors for your firm. Analyze
  - How many of the directors are inside directors (Employees of the firm, ex-managers)?
  - Is there any information on how independent the directors in the firm are from the managers?
- Are there any external measures of the quality of corporate governance of your firm?
  - Yahoo! Finance now reports on a corporate governance score for firms, where it ranks firms against the rest of the market and against their sectors.

## So, what next? When the cat is idle, the mice will play ....

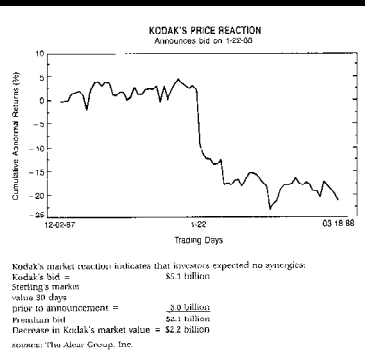
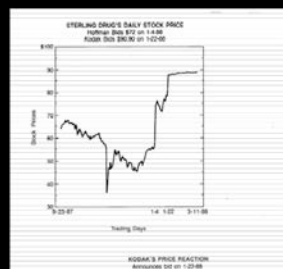
- When managers do not fear stockholders, they will often put their interests over stockholder interests
  - **Greenmail:** The (managers of ) target of a hostile takeover buy out the potential acquirer's existing stake, at a price much greater than the price paid by the raider, in return for the signing of a 'standstill' agreement.
  - **Golden Parachutes:** Provisions in employment contracts, that allows for the payment of a lump-sum or cash flows over a period, if managers covered by these contracts lose their jobs in a takeover.
  - **Poison Pills:** A security, the rights or cashflows on which are triggered by an outside event, generally a hostile takeover, is called a poison pill.
  - **Shark Repellents:** Anti-takeover amendments are also aimed at dissuading hostile takeovers, but differ on one very important count. They require the assent of stockholders to be instituted.
  - **Overpaying on takeovers:** Acquisitions often are driven by management interests rather than stockholder interests.

No stockholder approval needed..... Stockholder approval needed

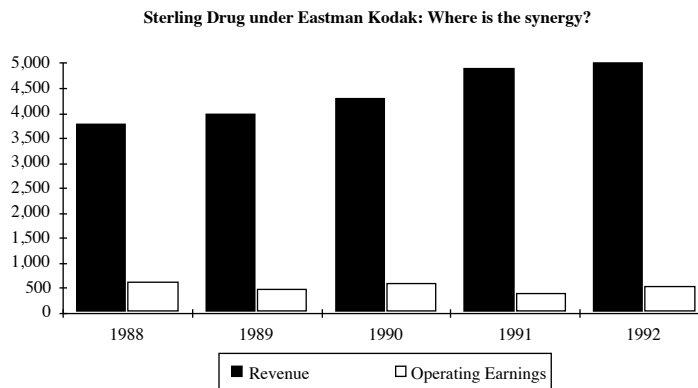
## Overpaying on takeovers

- The quickest and perhaps the most decisive way to impoverish stockholders is to overpay on a takeover.
- The stockholders in acquiring firms do not seem to share the enthusiasm of the managers in these firms. Stock prices of bidding firms decline on the takeover announcements a significant proportion of the time.
- Many mergers do not work, as evidenced by a number of measures.
  - The profitability of merged firms relative to their peer groups, does not increase significantly after mergers.
  - An even more damning indictment is that a large number of mergers are reversed within a few years, which is a clear admission that the acquisitions did not work.

## A Case Study: Kodak - Sterling Drugs



## Earnings and Revenues at Sterling Drugs



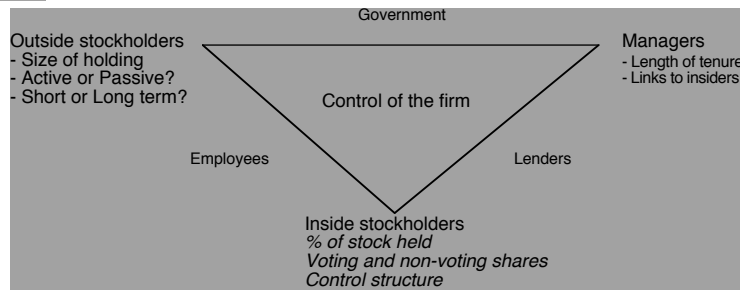
## Kodak Says Drug Unit Is Not for Sale ... but...

- An article in the NY Times in August of 1993 suggested that Kodak was eager to shed its drug unit.
  - In response, Eastman Kodak officials say they have no plans to sell Kodak's Sterling Winthrop drug unit.
  - Louis Mattis, Chairman of Sterling Winthrop, dismissed the rumors as "massive speculation, which flies in the face of the stated intent of Kodak that it is committed to be in the health business."
- A few months later... Taking a stride out of the drug business, Eastman Kodak said that the Sanofi Group, a French pharmaceutical company, agreed to buy the prescription drug business of Sterling Winthrop for **\$1.68 billion**.
  - Shares of Eastman Kodak rose 75 cents yesterday, closing at \$47.50 on the New York Stock Exchange.
  - Samuel D. Isaly an analyst, said the announcement was "very good for Sanofi and very good for Kodak."
  - "When the divestitures are complete, Kodak will be entirely focused on imaging," said George M. C. Fisher, the company's chief executive.
  - The rest of the Sterling Winthrop was sold to Smithkline for \$2.9 billion.

## ⌚ Application Test: Who owns/runs your firm?

Look at: Bloomberg printout **HDS** for your firm

- Who are the top stockholders in your firm?
- What are the potential conflicts of interests that you see emerging from this stockholding structure?



## Case 1: Splintering of Stockholders Disney's top stockholders in 2003

<HELP> for explanation. dgp Equity HDS  
 Enter #<GD> to select aggregate portfolio and see detailed information CUSIP 25468710  
 00118958224-000 **HOLDINGS SEARCH** Page 1 / 100  
**DIS US DISNEY (UNL) CD**

Holder name	Portfolio Name	Source	Held	Outstd	Percent	Latest Filing
BARCLAYS GLOBAL	BARCLAYS BANK PLC	13F	83,630M	4,055	1,750M	09/02
CITIGROUP INC	CITIGROUP INCORPORAT	13F	62,857M	3,078	4,811M	09/02
FIDELITY MANAGEM	FIDELITY MANAGEMENT	13F	56,125M	2,748	5,992M	09/02
46STATE STREET	STATE STREET CORPORA	13F	54,635M	2,675	2,239M	09/02
SOUTHEASTERN ASST	SOUTHEASTERN ASSET M	13F	47,333M	2,318	14,604M	09/02
ST FARM MU AUTO	STATE FARM MUTUAL AU	13F	41,938M	2,054	120,599	09/02
VANGUARD GROUP	VANGUARD GROUP INC	13F	34,721M	1,700	-83,839	09/02
MELLON BANK N A	MELLON BANK CORP	13F	32,693M	1,601	957,489	09/02
PUTNAM INVEST	PUTNAM INVESTMENT MA	13F	28,153M	1,379	-11,468M	09/02
LORD ABBETT & CO	LORD ABBETT & CO	13F	24,541M	1,202	5,385M	09/02
MONTAG CALDWELL	MONTAG & CALDWELL IN	13F	24,466M	1,198	-11,373M	09/02
DEUTSCHE BANK AK	DEUTSCHE BANK AG	13F	23,239M	1,138	-5,002M	09/02
MORGAN STANLEY	MORGAN STANLEY	13F	19,655M	0,962	3,482M	09/02
MORICE T ROWE	T ROWE PRICE ASSOCIA	13F	19,133M	0,937	2,925M	09/02
ISROY EDWARD DISNE	n/a	PROXY	17,547M	0,859	-126,710	12/01
BARAK FINANCIAL	ALLIANCE CAPITAL MAN	13F	14,283M	0,699	69,353	09/02
GROUP MORGAN CHASE	JP MORGAN CHASE & CO	13F	14,289M	0,698	-462,791	09/02
Sub-totals for current page:			599,159M	29,340		

\* Honey market directory info available. Select portfolio, then hit [F000].  
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 Hong Kong 852 2377 6800    Japan 81 3 3021 0990    Singapore 65 212 3990 0 5    U.S. 1 212 318 2000    Copyright © 2003 Bloomberg L.P.  
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## Case 2: Voting versus Non-voting Shares: Aracruz

- Aracruz Cellulose, like most Brazilian companies, had multiple classes of shares.
  - The common shares had all of the voting rights and were held by incumbent management, lenders to the company and the Brazilian government.
  - Outside investors held the non-voting shares, which were called preferred shares, and had no say in the election of the board of directors. At the end of 2002,
- Aracruz was managed by a board of seven directors, composed primarily of representatives of those who own the common (voting) shares, and an executive board, composed of three managers of the company.

## Case 3: Cross and Pyramid Holdings Tata Chemical's top stockholders in 2008

<HELP> for explanation.

As of Apr29 DELAYED Vol 502,362 Op 165 B HI 172 S Lo 165 B

Tata Chemicals Ltd ISIN INE092A01019

21) Sources	22) Types	23) Countries	24) Metro Areas	25) Advanced Filters		
Name Filter	Portfolio Name	Source	Amt Held	% Out	Latest Chg	File Dt
1) TATA SONS LTD	n/a	Ce File	33,534,323	14.26	0	12/31/08
2) LIFE INSURANCE CORP O	n/a	Ce File	27,537,984	11.71	6,856,022	12/31/08
3) TATA INVESTMENT CORP	n/a	Ce File	16,900,091	6.89	-299,000	12/31/08
4) TATA TEA LTD	n/a	Ce File	15,385,522	6.54	0	12/31/08
5) NEW INDIA ASSURANCE C	n/a	Ce File	6,868,895	2.88	0	12/31/08
6) HINDUSTAN LEVER LTD	n/a	Ce File	5,432,000	2.14	0	12/31/08
7) GENERAL INSURANCE CO	n/a	Ce File	4,996,262	2.12	6,000	12/31/08
8) UNITED INDIA INSURANC	n/a	Ce File	2,668,047	1.13	20,000	12/31/08
9) NATIONAL INSURANCE C	n/a	Ce File	2,373,302	1.01	0	12/31/08
10) TEMPLETON ASSET MGMT	TEMPLETON INDIA EQ	MF-IND	2,363,937	1.01	163,937	3/31/09
11) TEMPLETON ASSET MGMT	FRANKLIN INDIA FLEX	MF-IND	1,503,761	0.64	0	3/31/09
12) SBI FUNDS MANAGEMENT	SBI MAGNUM SECTOR	MF-IND	1,473,989	0.63	156,222	3/31/09
13) MBG INVESTMENT MANA	MBG INV (1)-SOUTH	UT-UK	1,451,251	0.62	-283,000	12/31/08
14) DWART INVESTMENTS LT	n/a	Ce File	1,369,290	0.59	0	12/31/08
15) TEMPLETON MANAGEMEN	TEMPLETON EMERGIN	MF-CAN	1,078,000	0.46	539,000	12/31/08
16) TEMPLETON ASSET MGMT	TEMPLETON INDIA G	MF-IND	1,054,645	0.45	554,645	3/31/09
17) BIRLA SUN LIFE ASSET M	BIRLA SUN LIFE SPEC	MF-IND	1,050,000	0.45	0	2/28/09

26) Latest Chg / 27) Hist Held

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Japan 81 3 3021 19003 Singapore 65 6212 1188 U.S. 1 212 010 0000 Copyright 2009 Bloomberg Finance L.P.  
SN 636136 6629-275-01-May-2009 10:48:56

## Things change.. Disney's top stockholders in 2009

Holder Name	Portfolio Name	Source	Mkt Val	% Out	Mkt Val Chg	File Dt
1) JOBS STEVEN PAUL	n/a	Form 4	2.34BLN	7.46	0	5/5/06
2) FIDELITY MANAGEMENT & FIDELITY MANAGEMENT		13F	2.05BLN	6.58	-36.12MLN	9/30/08
3) STATE STREET CORP	STATE STREET CORPO	13F	1.7BLN	5.79	-18.6MLN	9/30/08
4) BARCLAYS GLOBAL INVS BARCLAYS GLOBAL IN		13F	1.66BLN	5.70	160.12MLN	9/30/08
5) VANGUARD GROUP INC	VANGUARD GROUP IN	13F	1.38BLN	3.88	-6.82MLN	9/30/08
6) SOUTHEASTERN ASSET M	SOUTHEASTERN ASSE	13F	1.12BLN	2.50	-14.02MLN	9/30/08
7) STATE FARM MUTUAL AD	STATE FARM MUTUAL	13F	1.00BLN	2.28	0	9/30/08
8) WELLINGTON MANAGEMENT	WELLINGTON MANAGE	13F	939.38MLN	2.09	110.09MLN	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 B	13F	693.31MLN	1.55	-18.89MLN	9/30/08
11) MASSACHUSETTS FINANCIAL	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	610.20MLN	1.26	-4.91MLN	9/30/08
14) AXA	AXA	13F	486.20MLN	1.08	-47.02MLN	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	420.95MLN	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

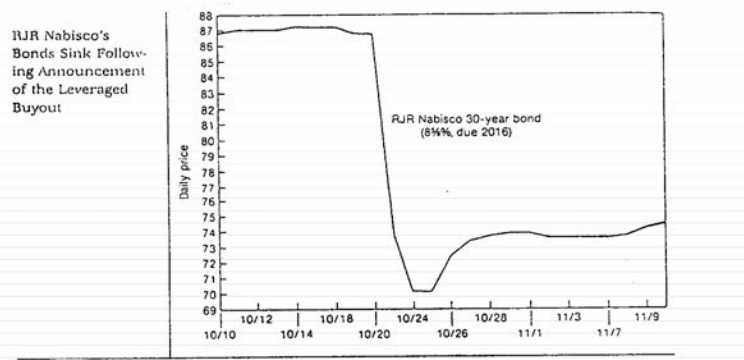
## II. Stockholders' objectives vs. Bondholders' objectives

- **In theory:** there is no conflict of interests between stockholders and bondholders.
- **In practice:** Stockholder and bondholders have different objectives. Bondholders are concerned most about safety and ensuring that they get paid their claims. Stockholders are more likely to think about upside potential

## Examples of the conflict..

- Increasing dividends significantly: When firms pay cash out as dividends, lenders to the firm are hurt and stockholders may be helped. This is because the firm becomes riskier without the cash.
- Taking riskier projects than those agreed to at the outset: Lenders base interest rates on their perceptions of how risky a firm's investments are. If stockholders then take on riskier investments, lenders will be hurt.
- Borrowing more on the same assets: If lenders do not protect themselves, a firm can borrow more money and make all existing lenders worse off.

## An Extreme Example: Unprotected Lenders?





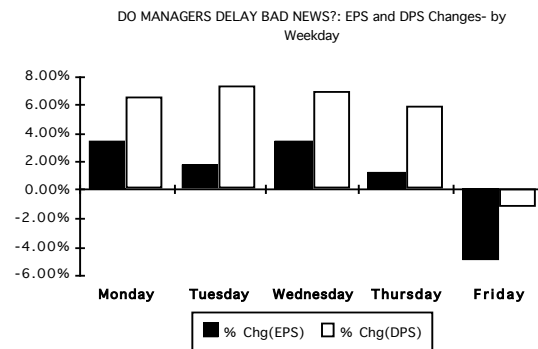
### III. Firms and Financial Markets

- **In theory:** Financial markets are efficient. Managers convey information honestly and in a timely manner to financial markets, and financial markets make reasoned judgments of the effects of this information on 'true value'. As a consequence-
  - A company that invests in good long term projects will be rewarded.
  - Short term accounting gimmicks will not lead to increases in market value.
  - Stock price performance is a good measure of company performance.
- **In practice:** There are some holes in the 'Efficient Markets' assumption.

### Managers control the release of information to the general public

- Information (especially negative) is sometimes suppressed or delayed by managers seeking a better time to release it.
- In some cases, firms release intentionally misleading information about their current conditions and future prospects to financial markets.

## Evidence that managers delay bad news?



## Some critiques of market efficiency..

- Investors are irrational and prices often move for not reason at all. As a consequence, prices are much more volatile than justified by the underlying fundamentals. Earnings and dividends are much less volatile than stock prices.
- Investors overreact to news, both good and bad.
- Financial markets are manipulated by insiders; Prices do not have any relationship to value.
- Investors are short-sighted, and do not consider the long-term implications of actions taken by the firm

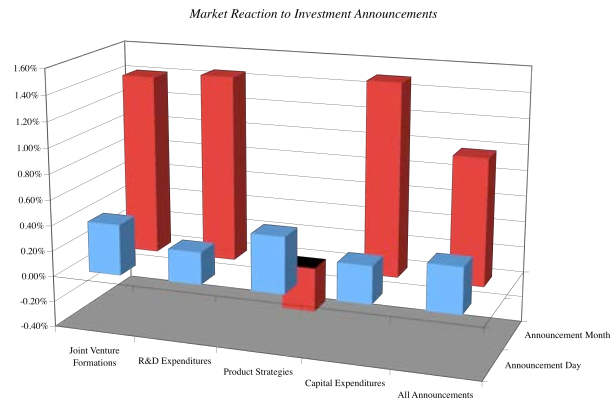
## Are Markets Short term?

- Focusing on market prices will lead companies towards short term decisions at the expense of long term value.
  - a. I agree with the statement
  - b. I do not agree with this statement
- Allowing managers to make decisions without having to worry about the effect on market prices will lead to better long term decisions.
  - a. I agree with this statement
  - b. I do not agree with this statement
- Neither managers nor markets are trustworthy. Regulations/laws should be written that force firms to make long term decisions.
  - a. I agree with this statement
  - b. I do not agree with this statement

## Are Markets short term? Some evidence that they are not..

- There are hundreds of start-up and small firms, with no earnings expected in the near future, that raise money on financial markets. Why would a myopic market that cares only about short term earnings attach high prices to these firms?
- If the evidence suggests anything, it is that markets do not value current earnings and cashflows enough and value future earnings and cashflows too much. After all, studies suggest that low PE stocks are under priced relative to high PE stocks
- The market response to research and development and investment expenditures is generally positive.

## Market Reaction to Investment Announcements



## But what about market crises?

- Many critics of markets point to market bubbles and crises as evidence that markets do not work. For instance, the market turmoil between September and December 2008 is pointed to as backing for the statement that free markets are the source of the problem and not the solution.
- There are two counter arguments that can be offered:
  - The events of the last quarter illustrate that we are more dependent on functioning, liquid markets, with risk taking investors, than ever before in history. As we saw, no government or other entity (bank, Buffett) is big enough to step in and save the day.
  - The firms that caused the market collapse (banks, investment banks) were among the most regulated businesses in the market place. If anything, their failures can be traced to their attempts to take advantage of regulatory loopholes (badly designed insurance programs... capital measurements that miss risky assets, especially derivatives)

## IV. Firms and Society

- **In theory:** All costs and benefits associated with a firm's decisions can be traced back to the firm.
- **In practice:** Financial decisions can create social costs and benefits.
  - A social cost or benefit is a cost or benefit that accrues to society as a whole and not to the firm making the decision.
    - Environmental costs (pollution, health costs, etc..)
    - Quality of Life' costs (traffic, housing, safety, etc.)
  - Examples of social benefits include:
    - creating employment in areas with high unemployment
    - supporting development in inner cities
    - creating access to goods in areas where such access does not exist

## Social Costs and Benefits are difficult to quantify because ..

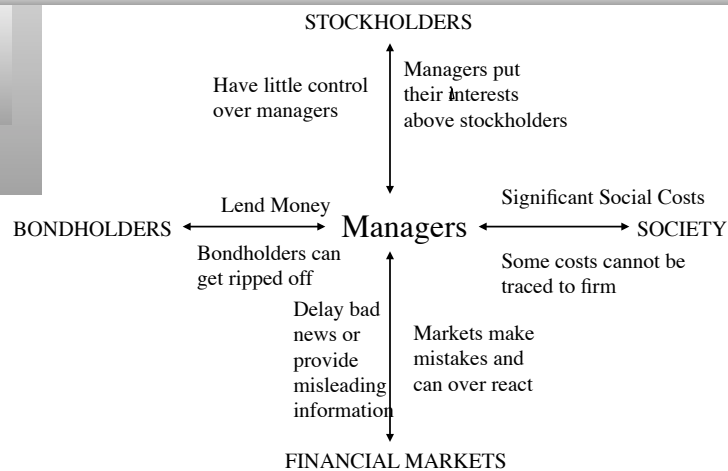
- They might not be known at the time of the decision. In other words, a firm may think that it is delivering a product that enhances society, at the time it delivers the product but discover afterwards that there are very large costs. (Asbestos was a wonderful product, when it was devised, light and easy to work with... It is only after decades that the health consequences came to light)
- They are 'person-specific' . (different decision makers weight them differently)
- They can be paralyzing if carried to extremes.

## A test of your social consciousness: Put your money where you mouth is...

Assume that you work for Disney and that you have an opportunity to open a store in an inner-city neighborhood. The store is expected to lose about a million dollars a year, but it will create much-needed employment in the area, and may help revitalize it.

- Would you open the store?
  - a) Yes
  - b) No
- If yes, would you tell your stockholders and let them vote on the issue?
  - a) Yes
  - b) No
- If no, how would you respond to a stockholder query on why you were not living up to your social responsibilities?

## So this is what can go wrong...



## Traditional corporate financial theory breaks down when ...

- The interests/objectives of the decision makers in the firm conflict with the interests of stockholders.
- Bondholders (Lenders) are not protected against expropriation by stockholders.
- Financial markets do not operate efficiently, and stock prices do not reflect the underlying value of the firm.
- Significant social costs can be created as a by-product of stock price maximization.

## When traditional corporate financial theory breaks down, the solution is:

- To choose a different mechanism for corporate governance, i.e., assign the responsibility for monitoring managers to someone other than stockholders.
- To choose a different objective for the firm.
- To maximize stock price, but reduce the potential for conflict and breakdown:
  - Making managers (decision makers) and employees into stockholders
  - Protect lenders from expropriation
  - By providing information honestly and promptly to financial markets
  - Minimize social costs

## An Alternative Corporate Governance System

- Germany and Japan developed a different mechanism for corporate governance, based upon corporate cross holdings.
  - In Germany, the banks form the core of this system.
  - In Japan, it is the keiretsus
  - Other Asian countries have modeled their system after Japan, with family companies forming the core of the new corporate families
- At their best, the most efficient firms in the group work at bringing the less efficient firms up to par. They provide a corporate welfare system that makes for a more stable corporate structure
- At their worst, the least efficient and poorly run firms in the group pull down the most efficient and best run firms down. The nature of the cross holdings makes its very difficult for outsiders (including investors in these firms) to figure out how well or badly the group is doing.

## Choose a Different Objective Function

- Firms can always focus on a different objective function. Examples would include
  - maximizing earnings
  - maximizing revenues
  - maximizing firm size
  - maximizing market share
  - maximizing EVA
- The key thing to remember is that these are intermediate objective functions.
  - To the degree that they are correlated with the long term health and value of the company, they work well.
  - To the degree that they do not, the firm can end up with a disaster



## Maximize Stock Price, subject to ..

- The strength of the stock price maximization objective function is its internal self correction mechanism. Excesses on any of the linkages lead, if unregulated, to counter actions which reduce or eliminate these excesses
- In the context of our discussion,
  - managers taking advantage of stockholders has led to a much more active market for corporate control.
  - stockholders taking advantage of bondholders has led to bondholders protecting themselves at the time of the issue.
  - firms revealing incorrect or delayed information to markets has led to markets becoming more “skeptical” and “punitive”
  - firms creating social costs has led to more regulations, as well as investor and customer backlashes.

## The Stockholder Backlash

- Institutional investors such as Calpers and the Lens Funds have become much more active in monitoring companies that they invest in and demanding changes in the way in which business is done
- Individuals like Carl Icahn specialize in taking large positions in companies which they feel need to change their ways (Blockbuster, Time Warner and Motorola) and push for change
- At annual meetings, stockholders have taken to expressing their displeasure with incumbent management by voting against their compensation contracts or their board of directors

## The Hostile Acquisition Threat

- The typical target firm in a hostile takeover has
  - a return on equity almost 5% lower than its peer group
  - had a stock that has significantly under performed the peer group over the previous 2 years
  - has managers who hold little or no stock in the firm
- In other words, the best defense against a hostile takeover is to run your firm well and earn good returns for your stockholders
- Conversely, when you do not allow hostile takeovers, this is the firm that you are most likely protecting (and not a well run or well managed firm)

## In response, boards are becoming more independent...

- Boards have become smaller over time. The median size of a board of directors has decreased from 16 to 20 in the 1970s to between 9 and 11 in 1998. The smaller boards are less unwieldy and more effective than the larger boards.
- There are fewer insiders on the board. In contrast to the 6 or more insiders that many boards had in the 1970s, only two directors in most boards in 1998 were insiders.
- Directors are increasingly compensated with stock and options in the company, instead of cash. In 1973, only 4% of directors received compensation in the form of stock or options, whereas 78% did so in 1998.
- More directors are identified and selected by a nominating committee rather than being chosen by the CEO of the firm. In 1998, 75% of boards had nominating committees; the comparable statistic in 1973 was 2%.

## Eisner's concession: Disney's Board in 2003

<i>Board Members</i>	<i>Occupation</i>
Reveta Bowers	Head of school for the Center for Early Education,
John Bryson	CEO and Chairman of Con Edison
Roy Disney	Head of Disney Animation
Michael Eisner	CEO of Disney
Judith Estrin	CEO of Packet Design (an internet company)
Stanley Gold	CEO of Shamrock Holdings
Robert Iger	Chief Operating Officer, Disney
Monica Lozano	Chief Operation Officer, La Opinion (Spanish newspaper)
George Mitchell	Chairman of law firm (Verner, Liipfert, et al.)
Thomas S. Murphy	Ex-CEO, Capital Cities ABC
Leo O'Donovan	Professor of Theology, Georgetown University
Sidney Poitier	Actor, Writer and Director
Robert A.M. Stern	Senior Partner of Robert A.M. Stern Architects of New York
Andrea L. Van de Kamp	Chairman of Sotheby's West Coast
Raymond L. Watson	Chairman of Irvine Company (a real estate corporation)
Gary L. Wilson	Chairman of the board, Northwest Airlines.

## Changes in corporate governance at Disney

- Required at least two executive sessions of the board, without the CEO or other members of management present, each year.
- Created the position of non-management presiding director, and appointed Senator George Mitchell to lead those executive sessions and assist in setting the work agenda of the board.
- Adopted a new and more rigorous definition of director independence.
- Required that a substantial majority of the board be comprised of directors meeting the new independence standards.
- Provided for a reduction in committee size and the rotation of committee and chairmanship assignments among independent directors.
- Added new provisions for management succession planning and evaluations of both management and board performance
- Provided for enhanced continuing education and training for board members.

## Eisner's exit... and a new age dawns? Disney's board in 2008

<i>Board Members</i>	<i>Occupation</i>
John E. Pepper, Jr. (Chairman)	Retired Chairman and CEO, Procter & Gamble Co.
Susan E. Arnold	President, Global Business Units, Procter & Gamble Co.
John E. Bryson	Retired Chairman and CEO, Edison International
John S. Chen	Chairman, CEO & President, Sybase, Inc.
Judith L. Estrin	CEO, JLABs, LLC.
Robert A. Iger	CEO, Disney
Steven P. Jobs	CEO, Apple
Fred Langhammer	Chairman, Global Affairs, The Estee Lauder Companies
Aylwin B. Lewis	President and CEO, Potbelly Sandwich Works
Monica Lozano	Publisher and CEO, La Opinion
Robert W. Matschullat	Retired Vice Chairman and CFO, The Seagram Co.
Orin C. Smith	Retired President and CEO, Starbucks Corporation

## What about legislation?

- Every corporate scandal creates impetus for a legislative response. The scandals at Enron and WorldCom laid the groundwork for Sarbanes-Oxley.
- You cannot legislate good corporate governance.
  - The costs of meeting legal requirements exceed the benefits
  - Laws always have unintended consequences
  - In general, laws tend to be blunderbusses that penalize good companies more than they punish the bad companies.

## Is there a payoff to better corporate governance?

- In the most comprehensive study of the effect of corporate governance on value, a governance index was created for each of 1500 firms based upon 24 distinct corporate governance provisions.
  - Buying stocks that had the strongest investor protections while simultaneously selling shares with the weakest protections generated an annual excess return of 8.5%.
  - Every one point increase in the index towards fewer investor protections decreased market value by 8.9% in 1999
  - Firms that scored high in investor protections also had higher profits, higher sales growth and made fewer acquisitions.
- The link between the composition of the board of directors and firm value is weak. Smaller boards do tend to be more effective.
- On a purely anecdotal basis, a common theme at problem companies is an ineffective board that fails to ask tough questions of an imperial CEO.

## The Bondholders' Defense Against Stockholder Excesses

- More restrictive covenants on investment, financing and dividend policy have been incorporated into both private lending agreements and into bond issues, to prevent future "Nabiscos".
- New types of bonds have been created to explicitly protect bondholders against sudden increases in leverage or other actions that increase lender risk substantially. Two examples of such bonds
  - Puttable Bonds, where the bondholder can put the bond back to the firm and get face value, if the firm takes actions that hurt bondholders
  - Ratings Sensitive Notes, where the interest rate on the notes adjusts to that appropriate for the rating of the firm
- More hybrid bonds (with an equity component, usually in the form of a conversion option or warrant) have been used. This allows bondholders to become equity investors, if they feel it is in their best interests to do so.

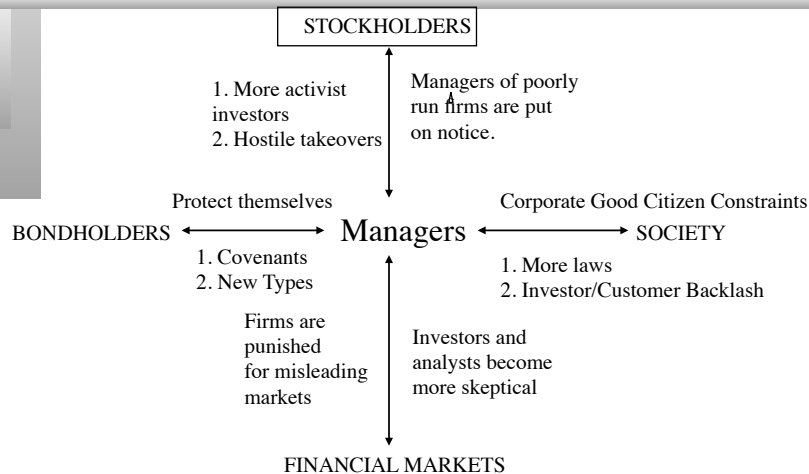
## The Financial Market Response

- While analysts are more likely still to issue buy rather than sell recommendations, the payoff to uncovering negative news about a firm is large enough that such news is eagerly sought and quickly revealed (at least to a limited group of investors).
- As investor access to information improves, it is becoming much more difficult for firms to control when and how information gets out to markets.
- As option trading has become more common, it has become much easier to trade on bad news. In the process, it is revealed to the rest of the market.
- When firms mislead markets, the punishment is not only quick but it is savage.

## The Societal Response

- If firms consistently flout societal norms and create large social costs, the governmental response (especially in a democracy) is for laws and regulations to be passed against such behavior.
- For firms catering to a more socially conscious clientele, the failure to meet societal norms (even if it is legal) can lead to loss of business and value.
- Finally, investors may choose not to invest in stocks of firms that they view as socially irresponsible.

## The Counter Reaction



## So what do you think?

- At this point in time, the following statement best describes where I stand in terms of the right objective function for decision making in a business
  - a) Maximize stock price, with no constraints
  - b) Maximize stock price, with constraints on being a good social citizen.
  - c) Maximize stockholder wealth, with good citizen constraints, and hope/pray that the market catches up with you.
  - d) Maximize profits or profitability
  - e) Maximize earnings growth
  - f) Maximize market share
  - g) Maximize revenues
  - h) Maximize social good
  - i) None of the above

## The Modified Objective Function

- For publicly traded firms in reasonably efficient markets, where bondholders (lenders) are protected:
  - Maximize Stock Price: This will also maximize firm value
- For publicly traded firms in inefficient markets, where bondholders are protected:
  - Maximize stockholder wealth: This will also maximize firm value, but might not maximize the stock price
- For publicly traded firms in inefficient markets, where bondholders are not fully protected
  - Maximize firm value, though stockholder wealth and stock prices may not be maximized at the same point.
- For private firms, maximize stockholder wealth (if lenders are protected) or firm value (if they are not)

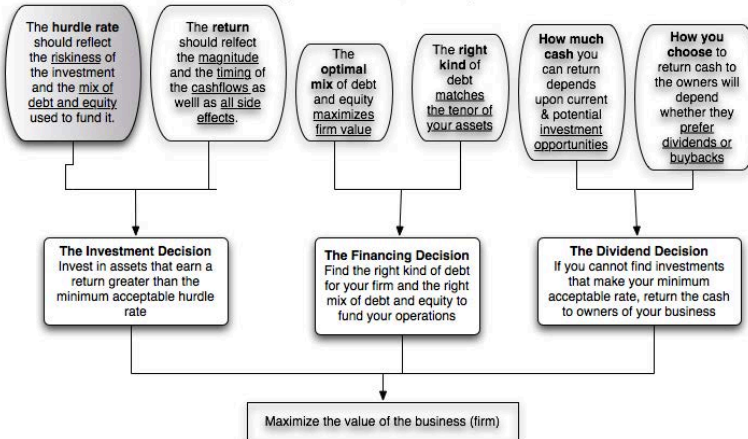
## The Investment Principle: Risk and Return Models

“You cannot swing upon a rope that is attached only to your own belt.”



## First Principles

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



## The notion of a benchmark

- Since financial resources are finite, there is a hurdle that projects have to cross before being deemed acceptable.
- This hurdle will be higher for riskier projects than for safer projects.
- A simple representation of the hurdle rate is as follows:
$$\text{Hurdle rate} = \text{Riskless Rate} + \text{Risk Premium}$$
- 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

危機

- The first symbol is the symbol for “danger”, while the second is the symbol for “opportunity”, making risk a mix of danger and opportunity. You cannot have one, without the other.

## A good risk and return model should...

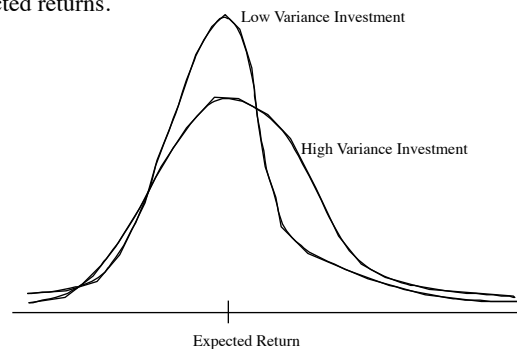
1. It should come up with a measure of risk that applies to all assets and not be asset-specific.
2. It should clearly delineate what types of risk are rewarded and what are not, and provide a rationale for the delineation.
3. It should come up with standardized risk measures, i.e., an investor presented 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

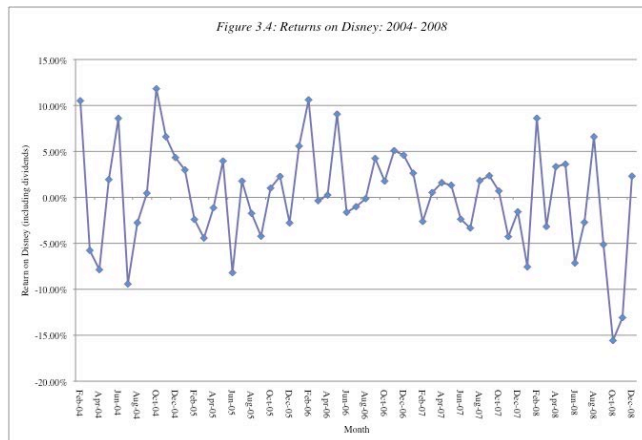
- Uses variance of actual returns around an expected return as a measure of risk.
- Specifies that a portion of variance can be diversified away, and that is only the non-diversifiable portion that is rewarded.
- Measures the non-diversifiable risk with beta, which is standardized around one.
- Translates beta into expected return -  
$$\text{Expected Return} = \text{Riskfree rate} + \text{Beta} * \text{Risk Premium}$$
- 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...



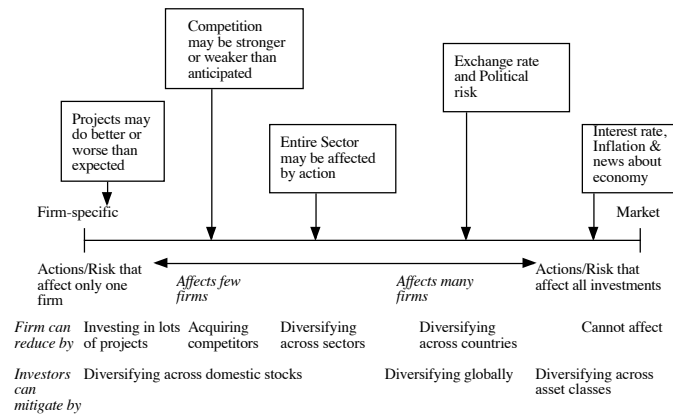
## Do you live in a mean-variance world?

- Assume that you had to pick between two investments. They have the same expected return of 15% and the same standard deviation of 25%; however, investment A offers a very small possibility that you could quadruple your money, while investment B's highest possible payoff is a 60% return. Would you
  - a. be indifferent between the two investments, since they have the same expected return and standard deviation?
  - b. prefer investment A, because of the possibility of a high payoff?
  - c. prefer investment B, because it is safer?

Would your answer change if you were not told that there is a small possibility that you could lose 100% of your money on investment A but that your worst case scenario with investment B is -50%?

## 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.)

## 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...

<i>Percent of Stock held by Institutions</i>	<i>Percent of Stock held by Insiders</i>	<i>Marginal Investor</i>
High	Low	Institutional Investor <sup>a</sup>
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)

Holder Name	Portfolio Name	Source	Mkt Val	% Out	Mkt Val Chg	File Dt
1) JOBS STEVEN PAUL	n/a	Form 4	2.34BLN	7.46	0	5/5/06
2) FIDELITY MANAGEMENT B	FIDELITY MANAGEMENT	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	6	9/30/08
8) WELLINGTON MANAGEM	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 B	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) AVA	AVA	13F	466.20MLN	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	420.85MLN	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

## And the top investors in Deutsche and Aracruz...

<i>Disney</i>	<i>Deutsche Bank</i>	<i>Aracruz Preferred</i>	<i>-Tata Chemicals</i>
Steven Jobs (7.43%)	Deutsche Post (8.05%)	BB DTVM (0.89%)	Tata Sons (14.26%)
Fidelity (4.86%)	Allianz (6.81%)	Barclays(0.34%)	Life Insurance Co (11.71%)
State Street (3.97%)	AXA (4.64%)	Banco Itau (0.32%)	Tata Investment (6.8%)
Barclays (3.79%)	Credit Suisse (3.55%)	Banco Barclays (0.19%)	Tata Tea (6.54%)
Vanguard Group (3.07%)	Deutsche Bank (3.52%)	Vanguard Group (0.18%)	New India Assur. (2.58%)
Southeastern Asset (2.40%)	Barclays (3.02%)	UBS Strategy (0.17%)	Hindustan Lever (2.14%)
State Farm Mutual (2.27%)	Blackrock (2.35%)	Banco Itau (0.17%)	General Insurance (2.12%)
AXA (2.13%)	UBS (1.65%)	Dimensional Fund (0.10%)	United India Insur. (1.13%)
Wellington Mgmt (1.87%)	Deka (1.52%)	Banco Bradesco (0.09%)	National Insurance (1.01%)
Massachusetts Finl (1.57%)	Dekabank (1.44%)	Landesbank (0.08%)	Templeton Funds (1.01%)

## Taking a closer look at Tata Chemicals...

Distribution of Shareholding as on March 31, 2007

Category	No. of Shares	Percentage	No. of Shareholders	Percentage
1 - 500	2,25,07,207	10.46	1,75,703	88.20
501 - 1000	96,48,263	4.49	12,926	6.49
1001 - 2000	87,86,211	4.09	6,155	3.09
2001 - 3000	46,01,699	2.14	1,855	0.93
3001 - 4000	27,70,825	1.29	786	0.39
4001 - 5000	24,11,227	1.12	528	0.27
5001 - 10000	57,32,258	2.66	809	0.41
Greater than 10000	15,86,44,961	73.75	442	0.22
<b>Total</b>	<b>21,51,02,651</b>	<b>100.00</b>	<b>199204</b>	<b>100.00</b>

Tata companies and trusts: 31.6%  
 Institutions & Funds: 34.68%  
 Foreign Funds: 5.91%



## 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)

<i>Preferred risk level</i>	<i>Allocation decision</i>
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

*Riskless Investment*

E(R)

*Low Risk Investment*

E(R)

*High Risk Investment*

E(R)

**Step 2: Differentiating between Rewarded and Unrewarded Risk**

<p><i>Risk that is specific to investment (Firm Specific)</i> 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 <b>The marginal investor is assumed to hold a "diversified" portfolio. Thus, only market risk will be rewarded and priced.</b></p>	<p><i>Risk that affects all investments (Market Risk)</i> Cannot be diversified away since most assets are affected by it.</p>
--	--

**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 <b>market portfolio</b> . <b>Market Risk = Risk added by any investment to the market portfolio:</b>	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. <b>Market Risk = Risk exposures of any asset to market factors</b>	Since market risk affects most or all investments, it must come from macro economic factors. <b>Market Risk = Risk exposures of any asset to macro economic factors.</b>	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. <b>Market Risk = Captured by the Proxy Variable(s)</b>
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.

## ⌚ Application Test: Who is the marginal investor in your firm?

You can get information on insider and institutional holdings in your firm from:

<http://finance.yahoo.com/>

Enter your company' s symbol and choose profile.

- Looking at the breakdown of stockholders in your firm, consider whether the marginal investor is
  - a) An institutional investor
  - b) An individual investor
  - c) An insider

## From Risk & Return Models to Hurdle Rates: Estimation Challenges

“The price of purity is purists...”

Anonymous

## Inputs required to use the CAPM -

- The capital asset pricing model yields the following expected return:  
Expected Return = Riskfree Rate + Beta \* (Expected Return on the Market Portfolio - Riskfree Rate)
- § To use the model we need three inputs:
  - (a) The current risk-free rate
  - (b) The expected market risk premium (the premium expected for investing in risky assets (market portfolio) over the riskless asset)
  - (c) The beta of the asset being analyzed.

## The Riskfree Rate and Time Horizon

- On a riskfree asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.
- For an investment to be riskfree, i.e., to have an actual return be equal to the expected return, two conditions have to be met –
  - There has to be no default risk, which generally implies that the security has to be issued by the government. Note, however, that not all governments can be viewed as default free.
  - There can be no uncertainty about reinvestment rates, which implies that it is a zero coupon security with the same maturity as the cash flow being analyzed.

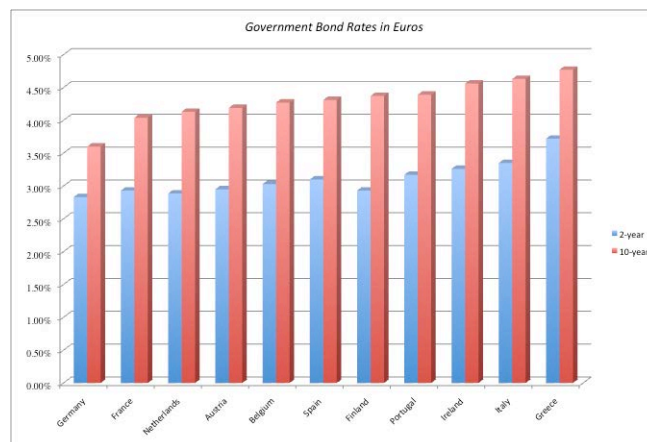
## Riskfree Rate in Practice

- The riskfree rate is the rate on a zero coupon government bond matching the time horizon of the cash flow being analyzed.
- Theoretically, this translates into using different riskfree rates for each cash flow - the 1 year zero coupon rate for the cash flow in year 1, the 2-year zero coupon rate for the cash flow in year 2 ...
- Practically speaking, if there is substantial uncertainty about expected cash flows, the present value effect of using time varying riskfree rates is small enough that it may not be worth it.

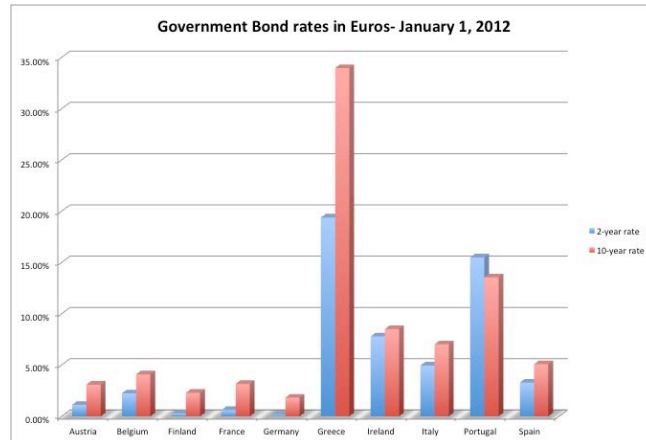
## The Bottom Line on Riskfree Rates

- Using a long term government rate (even on a coupon bond) as the riskfree rate on all of the cash flows in a long term analysis will yield a close approximation of the true value. For short term analysis, it is entirely appropriate to use a short term government security rate as the riskfree rate.
- The riskfree rate that you use in an analysis should be in the same currency that your cashflows are estimated in.
  - In other words, if your cashflows are in U.S. dollars, your riskfree rate has to be in U.S. dollars as well.
  - If your cash flows are in Euros, your riskfree rate should be a Euro riskfree rate.
- The conventional practice of estimating riskfree rates is to use the government bond rate, with the government being the one that is in control of issuing that currency. In US dollars, this has translated into using the US treasury rate as the riskfree rate. In May 2009, for instance, the ten-year US treasury bond rate was 3.5%.

## What is the Euro riskfree rate? An exercise in 2009



## The Euro rates: A 2012 update



## What if there is no default-free entity?

- If the government is perceived to have default risk, the government bond rate will have a default spread component in it and not be riskfree. There are three choices we have, when this is the case.
  - Adjust the local currency government borrowing rate for default risk to get a riskless local currency rate.
    - In May 2009, the Indian government rupee bond rate was 7%. the local currency rating from Moody's was Ba2 and the default spread for a Ba2 rated country bond was 3%.  
Riskfree rate in Rupees =  $7\% - 3\% = 4\%$
    - In May 2009, the Brazilian government \$R bond rate was 11% and the local currency rating was Ba1, with a default spread of 2.5%.  
Riskfree rate in \$R =  $11\% - 2.5\% = 8.5\%$
  - Do the analysis in an alternate currency, where getting the riskfree rate is easier. With Aracruz in 2009, we could chose to do the analysis in US dollars (rather than estimate a riskfree rate in R\$). The riskfree rate is then the US treasury bond rate.
  - Do your analysis in real terms, in which case the riskfree rate has to be a real riskfree rate. The inflation-indexed treasury rate is a measure of a real riskfree rate.

## Measurement of the risk premium

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

## What is your risk premium?

- Assume that stocks are the only risky assets and that you are offered two investment options:
  - a riskless investment (say a Government Security), on which you can make 5%
  - a mutual fund of all stocks, on which the returns are uncertain

How much of an expected return would you demand to shift your money from the riskless asset to the mutual fund?

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

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



## Risk Aversion and Risk Premiums

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

## Risk Premiums do change..

Go back to the previous example. Assume now that you are making the same choice but that you are making it in the aftermath of a stock market crash (it has dropped 25% in the last month). Would you change your answer?

- a) I would demand a larger premium
- b) I would demand a smaller premium
- c) I would demand the same premium

## Estimating Risk Premiums in Practice

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

## The Survey Approach

- Surveying all investors in a market place is impractical.
- However, you can survey a few individuals and use these results. In practice, this translates into surveys of the following:

<i>Group surveyed</i>	<i>Survey done by</i>	<i>Survey premium</i>
Individual investors	Securities Industries Assn	8.4% (in 2004). No updates since.
Institutional investors	Merrill Lynch	3.86% (January 2011)
CFOs	Graham & Harvey	3.00% (June 2010)
Academics	Pablo Fernandez	6.00% (US in 2009) 5.30% (Europe in 2009)

- The limitations of this approach are:
  - there are no constraints on reasonability (the survey could produce negative risk premiums or risk premiums of 50%)
  - The survey results are more reflective of the past than the future.
  - they tend to be short term; even the longest surveys do not go beyond one year.

## The Historical Premium Approach

- This is the default approach used by most to arrive at the premium to use in the model
- In most cases, this approach does the following
  - Defines a time period for the estimation (1928-Present, 1962-Present...)
  - Calculates average returns on a stock index during the period
  - Calculates average returns on a riskless security over the period
  - Calculates the difference between the two averages and uses it as a premium looking forward.
- The limitations of this approach are:
  - it assumes that the risk aversion of investors has not changed in a systematic way across time. (The risk aversion may change from year to year, but it reverts back to historical averages)
  - it assumes that the riskiness of the “risky” portfolio (stock index) has not changed in a systematic way across time.

## The Historical Risk Premium: Evidence from the United States

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2011	7.55%	5.79%	5.62%	4.10%
	2.22%	2.36%		
1962-2011	5.38%	3.36%	4.02%	2.35%
	2.39%	2.68%		
2002-2011	3.12%	-1.92%	1.08%	-3.61%
	6.46%	8.94%		

*What is the right premium?*

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

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

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

## What about historical premiums for other markets?

- Historical data for markets outside the United States is available for much shorter time periods. The problem is even greater in emerging markets.
- The historical premiums that emerge from this data reflect this data problem and there is much greater error associated with the estimates of the premiums.

## One solution: Look at a country's bond rating and default spreads as a start

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

## Beyond the default spread

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

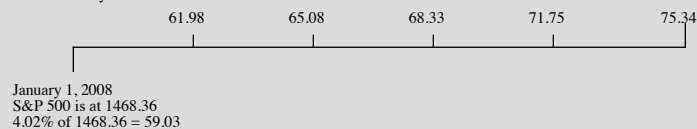
## An alternate view of ERP: Watch what I pay, not what I say.. January 2008

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

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

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

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



## Solving for the implied premium...

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

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

- Expected Return on Stocks = 8.39%
- Implied Equity Risk Premium = Expected Return on Stocks - T.Bond Rate = 8.39% - 4.02% = 4.37%

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

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

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

Analysts expect earnings to grow 4% a year for the next 5 years. We will assume that dividends & buybacks will keep pace.. Last year's cashflow (52.58) growing at 4% a year

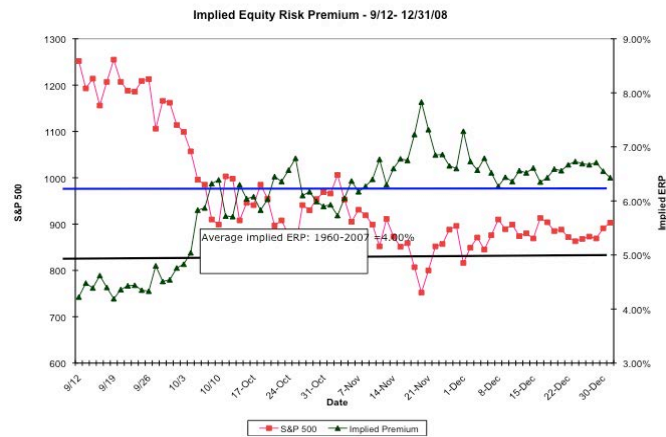
After year 5, we will assume that earnings on the index will grow at 2.21%, the same rate as the entire economy (= riskfree rate).

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

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

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

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



Aswath Damodaran

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## The bottom line on Equity Risk Premiums in early 2009

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

Aswath Damodaran

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## An Updated Equity Risk Premium:

- On January 1, 2012, the S&P 500 was at 1257.60, essentially unchanged for the year. And it was a year of macro shocks – political upheaval in the Middle East and sovereign debt problems in Europe. The treasury bond rate dropped below 2% and buybacks/dividends surged.

*In the trailing 12 months, the cash returned to stockholders was 74.17. Using the average cash yield of 4.71% for 2002-2011 the cash returned would have been 59.29.*

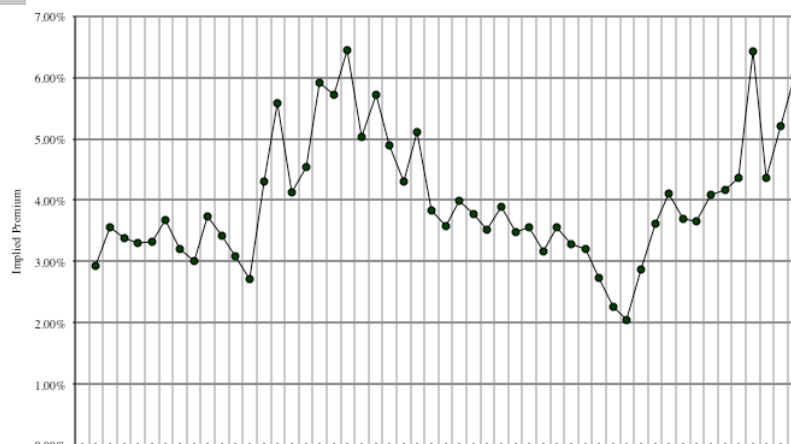
Analysts expect earnings to grow 9.6% in 2012, 11.9% in 2013, 8.2% in 2014, 4.5% in 2015 and 2% thereafter, resulting in a compounded annual growth rate of 7.18% over the next 5 years. We will assume that dividends & buybacks will grow 7.18% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.87%, the same rate as the entire economy (= riskfree rate).

	63.54		68.11		73.00		78.24		83.86
January 1, 2012 S&P 500 is at 1257.60 Adjusted Dividends & Buybacks for 2011 = 59.29	$1257.60 = \frac{63.54}{(1+r)} + \frac{68.11}{(1+r)^2} + \frac{73.00}{(1+r)^3} + \frac{78.24}{(1+r)^4} + \frac{83.86}{(1+r)^5} + \frac{83.86(1.0187)}{(r-.0187)(1+r)^5}$								
	Expected Return on Stocks (1/1/12) = 7.91% T.Bond rate on 1/1/12 = 1.87% Equity Risk Premium = 7.91% - 1.87% = 6.04%								

**Data Sources:**  
 Dividends and Buybacks last year: S&P  
 Expected growth rate: News stories, Yahoo! Finance, Bloomberg

## Implied Premiums in the US: 1960-2011







## Application Test: Estimating a Market Risk Premium

- In early 2012, the implied equity risk premium in the US was 6% and the historical risk premium was about 4%. Which would you use as your equity risk premium?
  - a) The historical risk premium (4%)
  - b) The current implied equity risk premium (6%)
  - c) Something else!
- What would you use for another developed market (say Germany or France)?
  - a) The historical risk premium for that market
  - b) The risk premium for the United States
- What would you use for an emerging market?
  - a) The historical risk premium for that market
  - b) The risk premium for the United States
  - c) The risk premium for the United States + Country Risk premium

## Estimating Beta

- The standard procedure for estimating betas is to regress stock returns ( $R_j$ ) against market returns ( $R_m$ ) -
$$R_j = a + b R_m$$
  - where  $a$  is the intercept and  $b$  is the slope of the regression.
- The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.

## Estimating Performance

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

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

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

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

- If

$a > R_f (1-b)$  .... Stock did better than expected during regression period

$a = R_f (1-b)$  .... Stock did as well as expected during regression period

$a < R_f (1-b)$  .... Stock did worse than expected during regression period

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

## Firm Specific and Market Risk

- The R squared ( $R^2$ ) of the regression provides an estimate of the proportion of the risk (variance) of a firm that can be attributed to market risk.
- The balance ( $1 - R^2$ ) can be attributed to firm specific risk.

## Setting up for the Estimation

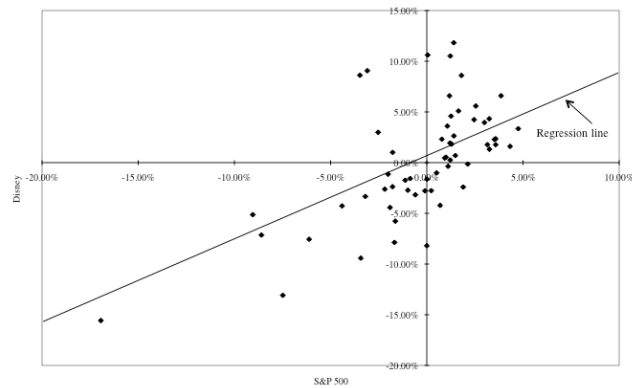
- Decide on an estimation period
  - Services use periods ranging from 2 to 5 years for the regression
  - Longer estimation period provides more data, but firms change.
  - Shorter periods can be affected more easily by significant firm-specific event that occurred during the period (Example: ITT for 1995-1997)
- Decide on a return interval - daily, weekly, monthly
  - Shorter intervals yield more observations, but suffer from more noise.
  - Noise is created by stocks not trading and biases all betas towards one.
- Estimate returns (including dividends) on stock
  - $\text{Return} = (\text{Price}_{\text{End}} - \text{Price}_{\text{Beginning}} + \text{Dividends}_{\text{Period}}) / \text{Price}_{\text{Beginning}}$
  - Included dividends only in ex-dividend month
- Choose a market index, and estimate returns (inclusive of dividends) on the index for each interval for the period.

## Choosing the Parameters: Disney

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

## Disney's Historical Beta

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



## The Regression Output

- Using monthly returns from 2004 to 2008, we ran a regression of returns on Disney stock against the S&P 500. The output is below:

$$\text{Returns}_{\text{Disney}} = 0.47\% + 0.95 \text{Returns}_{\text{S \& P 500}} \quad (\text{R squared} = 41\%)$$

(0.16)

## Analyzing Disney's Performance

- Intercept = 0.47%
  - This is an intercept based on monthly returns. Thus, it has to be compared to a monthly riskfree rate over the regression period (not today's numbers).
  - Between 2004 and 2008
    - Average Annualized T.Bill rate = 3.27%
    - Monthly Riskfree Rate = 0.272% (=3.27%/12)
    - Riskfree Rate (1-Beta) = 0.272% (1-0.95) = 0.01%
- The Comparison is then between

What you expected to make		What you actually made
Intercept	versus	Riskfree Rate (1 - Beta)
0.47%	versus	0.01%

  - Jensen's Alpha = 0.47% - 0.01% = 0.46%
- Disney did 0.46% better than expected, per month, between 2004 and 2008.
  - Annualized, Disney's annual excess return =  $(1.0046)^{12} - 1 = 5.62\%$

## More on Jensen's Alpha

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

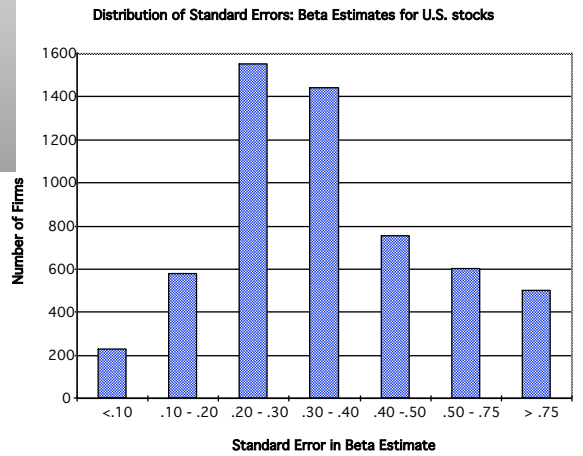
## A positive Jensen's alpha... Who is responsible?

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

## Estimating Disney's Beta

- Slope of the Regression of 0.95 is the beta
- Regression parameters are always estimated with error. The error is captured in the standard error of the beta estimate, which in the case of Disney is 0.16.
- Assume that I asked you what Disney's true beta is, after this regression.
  - What is your best point estimate?
  - What range would you give me, with 67% confidence?
  - What range would you give me, with 95% confidence?

## The Dirty Secret of “Standard Error”



## Breaking down Disney's Risk

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

## The Relevance of R Squared

You are a diversified investor trying to decide whether you should invest in Disney or Amgen. They both have betas of 0.95, but Disney has an R Squared of 41% while Amgen's R squared of only 20.5%. Which one would you invest in?

- a) Amgen, because it has the lower R squared
- b) Disney, because it has the higher R squared
- c) You would be indifferent

Would your answer be different if you were an undiversified investor?

## Beta Estimation: Using a Service (Bloomberg)





## Estimating Expected Returns for Disney in May 2009

- Inputs to the expected return calculation
  - Disney's Beta = 0.95
  - Riskfree Rate = 3.50% (U.S. ten-year T.Bond rate in May 2009)
  - Risk Premium = 6% (Based on updated implied premium at the start of 2009)
- Expected Return = Riskfree Rate + Beta (Risk Premium)  
= 3.50% + 0.95 (6.00%) = 9.2%

## Use to a Potential Investor in Disney

As a potential investor in Disney, what does this expected return of 9.2% tell you?

- a) This is the return that I can expect to make in the long term on Disney, if the stock is correctly priced and the CAPM is the right model for risk,
- b) This is the return that I need to make on Disney in the long term to break even on my investment in the stock
- c) Both

Assume now that you are an active investor and that your research suggests that an investment in Disney will yield 12.5% a year for the next 5 years. Based upon the expected return of 9.2%, you would

- a) Buy the stock
- b) Sell the stock

## How managers use this expected return

- Managers at Disney
  - need to make at least 9.2% as a return for their equity investors to break even.
  - this is the hurdle rate for projects, when the investment is analyzed from an equity standpoint
- In other words, Disney's cost of equity is 9.2%.
- What is the cost of not delivering this cost of equity?

## ⌚ Application Test: Analyzing the Risk Regression

- Using your Bloomberg risk and return print out, answer the following questions:
  - How well or badly did your stock do, relative to the market, during the period of the regression?  
$$\text{Intercept} - (\text{Riskfree Rate}/n) (1 - \text{Beta}) = \text{Jensen's Alpha}$$

where n is the number of return periods in a year (12 if monthly; 52 if weekly)
  - What proportion of the risk in your stock is attributable to the market? What proportion is firm-specific?
  - What is the historical estimate of beta for your stock? What is the range on this estimate with 67% probability? With 95% probability?
  - Based upon this beta, what is your estimate of the required return on this stock?  
$$\text{Riskless Rate} + \text{Beta} * \text{Risk Premium}$$

## A Quick Test

You are advising a very risky software firm on the right cost of equity to use in project analysis. You estimate a beta of 3.0 for the firm and come up with a cost of equity of 21.5%. The CFO of the firm is concerned about the high cost of equity and wants to know whether there is anything he can do to lower his beta.

How do you bring your beta down?

Should you focus your attention on bringing your beta down?

- a) Yes
- b) No

## Disney's Beta Calculation: An Updated Value!!



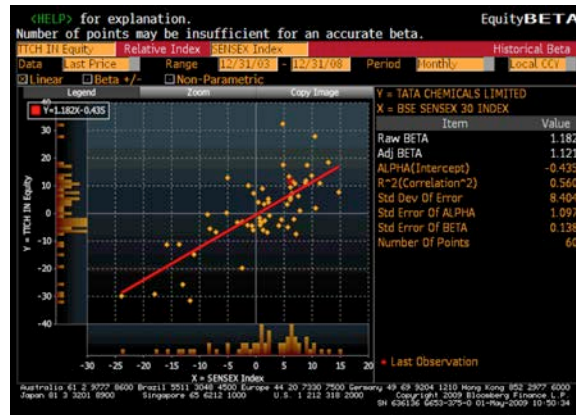
Jensen's alpha = 0.33% -  
 $(2\%/52) (1 - 1.08) = 0.34\%$   
 Annualized =  $(1 + 0.0034)^{52} - 1$   
 = 19.30%

This is a weekly regression

Jensen's  $\alpha$   
 $= -0.44\% - 5\%/12 (1-1.18) = -0.37\%$   
 Annualized  $= (1-.0037)^{12}-1 = -4.29\%$

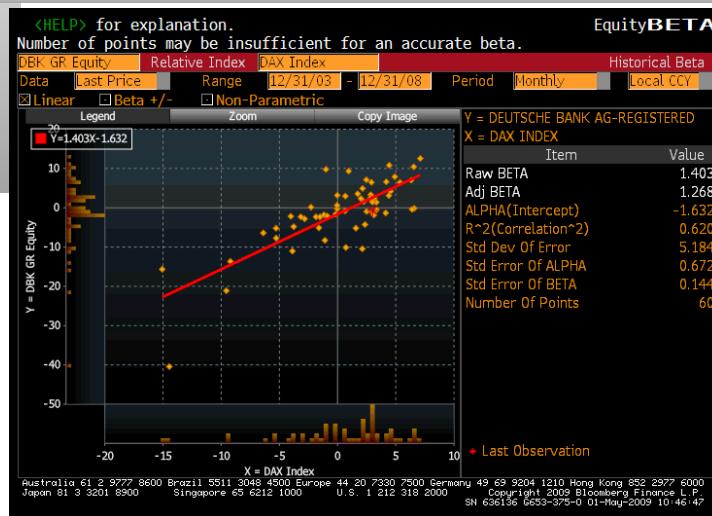
Expected Return  
 $= \text{Riskfree Rate} + \text{Beta} * \text{Risk premium}$   
 $= 4\% + 1.18 (6\% + 4.51\%) = 19.40\%$

### Regression Diagnostics for Tata Chemicals



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

### Beta Estimation and Index Choice: Deutsche Bank



## A Few Questions

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

## Deutsche Bank: Alternate views of Risk

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

## Aracruz's Beta?



## Beta: Exploring Fundamentals

Beta > 1	Real Networks: 3.24
	Qwest Communications: 2.60
Beta = 1	Microsoft: 1.25
	General Electric: 1.10
	Enron: 0.95
Beta < 1	Philip Morris: 0.65
	Exxon Mobil: 0.40
Beta = 0	Harmony Gold Mining: -0.10

## Determinant 1: Product Type

- **Industry Effects:** The beta value for a firm depends upon the sensitivity of the demand for its products and services and of its costs to macroeconomic factors that affect the overall market.
  - Cyclical companies have higher betas than non-cyclical firms
  - Firms which sell more discretionary products will have higher betas than firms that sell less discretionary products

## A Simple Test

Phone service is close to being non-discretionary in the United States and Western Europe. However, in much of Asia and Latin America, there are large segments of the population for which phone service is a luxury. Given our discussion of discretionary and non-discretionary products, which of the following conclusions would you be willing to draw:

- a) Emerging market telecom companies should have higher betas than developed market telecom companies.
- b) Developed market telecom companies should have higher betas than emerging market telecom companies
- c) The two groups of companies should have similar betas

## Determinant 2: Operating Leverage Effects

- Operating leverage refers to the proportion of the total costs of the firm that are fixed.
- Other things remaining equal, higher operating leverage results in greater earnings variability which in turn results in higher betas.

## Measures of Operating Leverage

Fixed Costs Measure =  $\text{Fixed Costs} / \text{Variable Costs}$

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

EBIT Variability Measure =  $\% \text{ Change in EBIT} / \% \text{ Change in Revenues}$

- This measures how quickly the earnings before interest and taxes changes as revenue changes. The higher this number, the greater the operating leverage.



## Disney's Operating Leverage: 1987- 2008

Year	Net Sales	% Change in Sales	EBIT	% Change in EBIT
1987	\$2,877		\$756	
1988	\$3,438	19.50%	\$848	12.17%
1989	\$4,394	33.62%	\$1,177	38.80%
1990	\$5,844	27.21%	\$1,368	16.23%
1991	\$6,182	5.78%	\$1,124	-17.84%
1992	\$7,504	21.38%	\$1,287	14.50%
1993	\$8,529	13.66%	\$1,560	21.21%
1994	\$10,055	17.89%	\$1,804	15.64%
1995	\$12,112	20.46%	\$2,262	25.39%
1996	\$18,739	54.71%	\$3,024	33.69%
1997	\$22,473	19.93%	\$3,945	30.46%
1998	\$22,976	2.24%	\$3,843	-2.59%
1999	\$23,435	2.00%	\$3,580	-6.84%
2000	\$25,418	8.46%	\$2,525	-29.47%
2001	\$25,172	-0.97%	\$2,832	12.16%
2002	\$25,329	0.62%	\$2,384	-15.82%
2003	\$27,061	6.84%	\$2,713	13.80%
2004	\$30,752	13.64%	\$4,048	49.21%
2005	\$31,944	3.88%	\$4,107	1.46%
2006	\$33,747	5.64%	\$5,355	30.39%
2007	\$35,510	5.22%	\$6,829	27.53%
2008	\$37,843	6.57%	\$7,404	8.42%
Average: 87-08		13.73%		13.26%
Average: 96-08		9.91%		11.72%

## Reading Disney's Operating Leverage

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

### Determinant 3: Financial Leverage

- As firms borrow, they create fixed costs (interest payments) that make their earnings to equity investors more volatile.
- This increased earnings volatility which increases the equity beta.

### Equity Betas and Leverage

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

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

where

- $\beta_L$  = Levered or Equity Beta
- $\beta_u$  = Unlevered or Asset Beta
- t = Marginal tax rate
- D = Market Value of Debt
- E = Market Value of Equity

## Effects of leverage on betas: Disney

- The regression beta for Disney is 0.95. This beta is a levered beta (because it is based on stock prices, which reflect leverage) and the leverage implicit in the beta estimate is the average market debt equity ratio during the period of the regression (2004 to 2008)
- The average debt equity ratio during this period was 24.64%.
- The unlevered beta for Disney can then be estimated (using a marginal tax rate of 38%)
  - = Current Beta / (1 + (1 - tax rate) (Average Debt/Equity))
  - = 0.95 / (1 + (1 - 0.38)(0.2464))= 0.8241

## Disney : Beta and Leverage

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

## Betas are weighted Averages

- The beta of a portfolio is always the market-value weighted average of the betas of the individual investments in that portfolio.
- Thus,
  - the beta of a mutual fund is the weighted average of the betas of the stocks and other investment in that portfolio
  - the beta of a firm after a merger is the market-value weighted average of the betas of the companies involved in the merger.

## The Disney/Cap Cities Merger: Pre-Merger

### Disney: The Acquirer

Equity Beta  
1.15

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

+

### Capital Cities: The Target

Equity Beta  
0.95

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

## Disney Cap Cities Beta Estimation: Step 1

- Calculate the unlevered betas for both firms
  - Disney's unlevered beta =  $1.15/(1+0.64*0.10) = 1.08$
  - Cap Cities unlevered beta =  $0.95/(1+0.64*0.03) = 0.93$

- Calculate the unlevered beta for the combined firm

- Unlevered Beta for combined firm  
 $= 1.08 (34286/53401) + 0.93 (19115/53401)$   
 $= 1.026$

The weights used are the firm values (and not just the equity values) of the two firms, since these are unlevered betas and thus reflects the risks of the entire businesses and not just the equity]

## Disney Cap Cities Beta Estimation: Step 2

- If Disney had used all equity to buy Cap Cities equity, while assuming Cap Cities debt, the consolidated numbers would have looked as follows:
  - Debt = \$ 3,186+ \$615 = \$ 3,801 million
  - Equity = \$ 31,100 + \$18,500 = \$ 49,600 m (Disney issues \$18.5 billion in equity)
  - D/E Ratio =  $3,801/49600 = 7.66\%$
  - New Beta =  $1.026 (1 + 0.64 (.0766)) = 1.08$
- Since Disney borrowed \$ 10 billion to buy Cap Cities/ABC, funded the rest with new equity and assumed Cap Cities debt:
  - The market value of Cap Cities equity is \$18.5 billion. If \$ 10 billion comes from debt, the balance (\$8.5 billion) has to come from new equity.
  - Debt = \$ 3,186 + \$615 million + \$ 10,000 = \$ 13,801 million
  - Equity = \$ 31,100 + \$8,500 = \$39,600 million
  - D/E Ratio =  $13,801/39600 = 34.82\%$
  - New Beta =  $1.026 (1 + 0.64 (.3482)) = 1.25$

## Firm Betas versus divisional Betas

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

## Bottom-up versus Top-down Beta

- The top-down beta for a firm comes from a regression
- The bottom up beta can be estimated by doing the following:
  - Find out the businesses that a firm operates in
  - Find the unlevered betas of other firms in these businesses
  - Take a weighted (by sales or operating income) average of these unlevered betas
  - Lever up using the firm's debt/equity ratio
- The bottom up beta is a better estimate than the top down beta for the following reasons
  - The standard error of the beta estimate will be much lower
  - The betas can reflect the current (and even expected future) mix of businesses that the firm is in rather than the historical mix

## Disney's business breakdown

Unlevered Beta  
(1 - Cash/ Firm Value)

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

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## 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

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## 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.

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

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

Business	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	D/E Ratio
Business	Estimated 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	33.89%	\$2,015	10.82%	\$1,805	\$3,950	45.70%
Consumer Products	\$768	27.21%	\$164	0.88%	\$147	\$621	23.70%
For example, Media Networks	\$34,328	38.71%	\$4,328*(.3871/.1.3871)	9581/18624	.5144*16,682	34328-8582	8582/25746

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

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

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

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

Riskfree Rate = 3.5%  
Risk Premium = 6%



## Discussion Issue

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

## Estimating Aracruz's Bottom Up Beta

Bottom up Betas for Paper & Pulp

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

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

## Aracruz: Cost of Equity Calculation

- We will use a risk premium of 9.95% in computing the cost of equity, composed of the mature market equity risk premium (6%) and the Brazil country risk premium of 3.95% (estimated earlier).

- U.S. \$ Cost of Equity

$$\begin{aligned} \text{Cost of Equity} &= 10\text{-yr T.Bond rate} + \text{Beta} * \text{Risk Premium} \\ &= 3.5\% + 1.74 (9.95\%) = 20.82\% \end{aligned}$$

- To convert to a Nominal \$R Cost of Equity

$$\begin{aligned} \text{Cost of Equity} &= (1 + \$ \text{Cost of Equity}) \frac{(1 + \text{Inflation Rate}_{\text{Brazil}})}{(1 + \text{Inflation Rate}_{\text{US}})} - 1 \\ &= 1.2082 (1.07/1.02) - 1 = .2675 \text{ or } 26.75\% \end{aligned}$$

(Alternatively, you could just replace the riskfree rate with a nominal \$R riskfree rate, but you would then be keeping risk premiums which were computed in dollar terms fixed while moving to a higher inflation currency)

## The bottom up beta for Tata Chemicals

### Unlevered betas for Tata Chemical's Businesses

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

### Cost of Equity

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

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

## Estimating Bottom-up Beta: Deutsche Bank

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

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

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

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

## Estimating Betas for Non-Traded Assets

- The conventional approaches of estimating betas from regressions do not work for assets that are not traded. There are no stock prices or historical returns that can be used to compute regression betas.
- There are two ways in which betas can be estimated for non-traded assets
  - Using comparable firms
  - Using accounting earnings

## Using comparable firms to estimate beta for Bookscape

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

## Estimating Bookscape Levered Beta and Cost of Equity

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

## Using Accounting Earnings to Estimate Beta

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

## The Accounting Beta for Bookscape

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

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

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

## Total Risk versus Market Risk

- Adjust the beta to reflect total risk rather than market risk. This adjustment is a relatively simple one, since the R squared of the regression measures the proportion of the risk that is market risk.
  - Total Beta = Market Beta / Correlation of the sector with the market
- In the Bookscape example, where the market beta is 1.35 and the average R-squared of the comparable publicly traded firms is 21.58%; the correlation with the market is 46.45%.

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

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

## ⌚ Application Test: Estimating a Bottom-up Beta

- Based upon the business or businesses that your firm is in right now, and its current financial leverage, estimate the bottom-up unlevered beta for your firm.
- *Data Source:* You can get a listing of unlevered betas by industry on my web site by going to updated data.

## From Cost of Equity to Cost of Capital

- The cost of capital is a composite cost to the firm of raising financing to fund its projects.
- In addition to equity, firms can raise capital from debt

## What is debt?

- General Rule: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.
- As a consequence, debt should include
  - Any interest-bearing liability, whether short term or long term.
  - Any lease obligation, whether operating or capital.

## Estimating the Cost of Debt

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



## Estimating Synthetic Ratings

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

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

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

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

## Interest Coverage Ratios, Ratings and Default Spreads- Early 2009

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

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

## Synthetic versus Actual Ratings: Disney and Aracruz

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

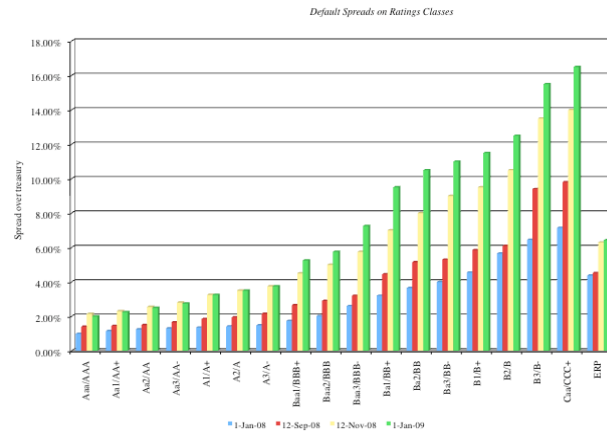
## Estimating Cost of Debt

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

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

- For Tata Chemicals, we will use the synthetic rating of A-, but we also consider the fact that India faces default risk (and a spread of 3%).
  - Pre-tax cost of debt = Riskfree Rate(Rs) + Country Spread + Company spread = 4% + 3% + 3% = 10%
  - After-tax cost of debt = Pre-tax cost of debt (1 - tax rate) = 10% (1 - .34) = 6.6%

## Default looms larger.. And spreads widen.. The effect of the market crisis – January 2008 to January 2009



## Updated Default Spreads - January 2012

Rating	1 year	5 year	10 year	30 year
Aaa/AAA	0.35%	0.70%	0.65%	0.85%
Aa1/AA+	0.45%	0.75%	0.80%	1.10%
Aa2/AA	0.50%	0.80%	0.95%	1.15%
Aa3/AA-	0.60%	0.85%	1.05%	1.20%
A1/A+	0.65%	0.90%	1.15%	1.30%
A2/A	0.80%	1.05%	1.20%	1.40%
A3/A-	0.95%	1.25%	1.45%	1.65%
Baa1/BBB+	1.20%	1.70%	2.00%	2.20%
Baa2/BBB	1.30%	2.05%	2.30%	2.50%
Baa3/BBB-	2.00%	2.80%	3.10%	3.25%
Ba1/BB+	4.00%	4.00%	3.75%	3.75%
Ba2/BB	4.50%	5.50%	4.50%	4.75%
Ba3/BB-	4.75%	5.75%	4.75%	5.25%
B1/B+	5.75%	6.75%	5.50%	5.50%
B2/B	6.25%	7.75%	6.50%	6.00%
B3/B-	6.50%	9.00%	6.75%	6.25%
Caa/CCC	7.25%	9.25%	8.75%	8.25%
CC	8.00%	9.50%	9.50%	9.50%
C	9.00%	10.00%	10.50%	10.50%
D	10.00%	12.00%	12.00%	12.00%

## ⌚ Application Test: Estimating a Cost of Debt

- Based upon your firm's current earnings before interest and taxes, its interest expenses, estimate
  - An interest coverage ratio for your firm
  - A synthetic rating for your firm (use the tables from prior pages)
  - A pre-tax cost of debt for your firm
  - An after-tax cost of debt for your firm

## Costs of Hybrids

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

## Weights for Cost of Capital Calculation

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

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

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

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

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

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

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

## And operating leases...

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

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

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

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

## ⌚ Application Test: Estimating Market Value

- Estimate the
  - Market value of equity at your firm and Book Value of equity
  - Market value of debt and book value of debt (If you cannot find the average maturity of your debt, use 3 years): Remember to capitalize the value of operating leases and add them on to both the book value and the market value of debt.
- Estimate the
  - Weights for equity and debt based upon market value
  - Weights for equity and debt based upon book value

## Current Cost of Capital: Disney

- Equity
    - Cost of Equity = Riskfree rate + Beta \* Risk Premium  
= 3.5% + 0.9011 (6%) = 8.91%
    - Market Value of Equity = \$45.193 Billion
    - Equity/(Debt+Equity) = 73.04%
  - Debt
    - After-tax Cost of debt = (Riskfree rate + Default Spread) (1-t)  
= (3.5%+2.5%) (1-.38) = 3.72%
    - Market Value of Debt = \$ 16.682 Billion
    - Debt/(Debt +Equity) = 26.96%
  - Cost of Capital = 8.91%(.7304)+3.72%(.2696) = 7.51%
- $\uparrow$   
 $45.193 / (45.193 + 16.682)$

## Divisional Costs of Capital: Disney and Tata Chemicals

### Disney

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

### Tata Chemicals

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

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

### Aracruz

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

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

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

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

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

## Bookscape's Cost of Capital

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

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



## ⌚ Application Test: Estimating Cost of Capital

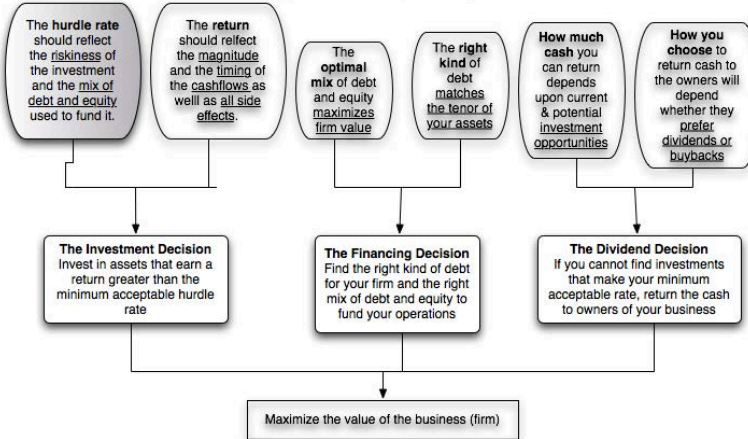
- Using the bottom-up unlevered beta that you computed for your firm, and the values of debt and equity you have estimated for your firm, estimate a bottom-up levered beta and cost of equity for your firm.
- Based upon the costs of equity and debt that you have estimated, and the weights for each, estimate the cost of capital for your firm.
- How different would your cost of capital have been, if you used book value weights?

## Choosing a Hurdle Rate

- Either the cost of equity or the cost of capital can be used as a hurdle rate, depending upon whether the returns measured are to equity investors or to all claimholders on the firm (capital)
- If returns are measured to equity investors, the appropriate hurdle rate is the cost of equity.
- If returns are measured to capital (or the firm), the appropriate hurdle rate is the cost of capital.

## Back to First Principles

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



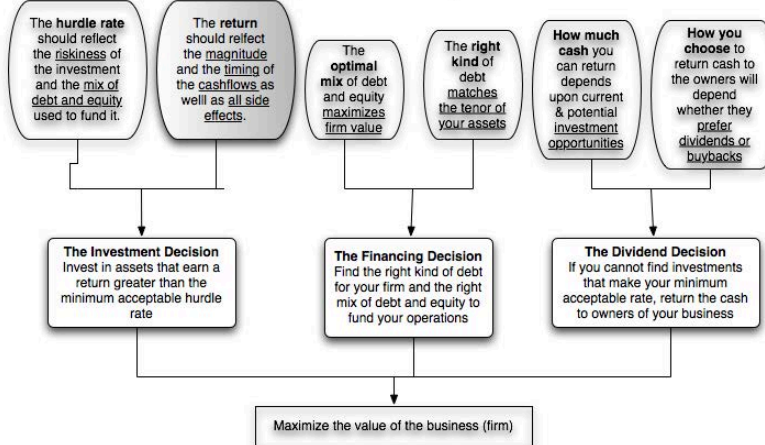
## Measuring Investment Returns I: The Mechanics of Investment Analysis

“Show me the money”

from *Jerry Maguire*

## First Principles

### Chapters 5 & 6: Measuring Returns on Investments



## Measures of return: earnings versus cash flows

- Principles Governing Accounting Earnings Measurement
  - **Accrual Accounting:** Show revenues when products and services are sold or provided, not when they are paid for. Show expenses associated with these revenues rather than cash expenses.
  - **Operating versus Capital Expenditures:** Only expenses associated with creating revenues in the current period should be treated as operating expenses. Expenses that create benefits over several periods are written off over multiple periods (as depreciation or amortization)
- To get from accounting earnings to cash flows:
  - you have to add back non-cash expenses (like depreciation)
  - you have to subtract out cash outflows which are not expensed (such as capital expenditures)
  - you have to make accrual revenues and expenses into cash revenues and expenses (by considering changes in working capital).

## Measuring Returns Right: The Basic Principles

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

The Return Mantra: “Time-weighted, Incremental Cash Flow Return”

## Setting the table: What is an investment/project?

- An investment/project can range the spectrum from big to small, money making to cost saving:
  - Major strategic decisions to enter new areas of business or new markets.
  - Acquisitions of other firms are projects as well, notwithstanding attempts to create separate sets of rules for them.
  - Decisions on new ventures within existing businesses or markets.
  - Decisions that may change the way existing ventures and projects are run.
  - Decisions on how best to deliver a service that is necessary for the business to run smoothly.
- Put in broader terms, every choice made by a firm can be framed as an investment.

## Here are four examples...

- Rio Disney: We will consider whether Disney should invest in its first theme parks in South America. These parks, while similar to those that Disney has in other parts of the world, will require us to consider the effects of country risk and currency issues in project analysis.
- New Paper Plant for Aracruz: Aracruz, as a paper and pulp company, is examining whether to invest in a new paper plant in Brazil.
- An Online Store for Bookscape: Bookscape is evaluating whether it should create an online store to sell books. While it is an extension of their basis business, it will require different investments (and potentially expose them to different types of risk).
- Acquisition of Sentient by Tata Chemicals: Sentient is a US firm that manufactures chemicals for the food processing business. This cross-border acquisition by Tata Chemicals will allow us to examine currency and risk issues in such a transaction.

## Earnings versus Cash Flows: A Disney Theme Park

- The theme parks to be built near Rio, modeled on Euro Disney in Paris and Disney World in Orlando.
- The complex will include a “Magic Kingdom” to be constructed, beginning immediately, and becoming operational at the beginning of the second year, and a second theme park modeled on Epcot Center at Orlando to be constructed in the second and third year and becoming operational at the beginning of the fourth year.
- The earnings and cash flows are estimated in nominal U.S. Dollars.

## Key Assumptions on Start Up and Construction

- The cost of constructing Magic Kingdom will be \$3 billion, with \$ 2 billion to be spent right now, and \$1 Billion to be spent one year from now.
- Disney has already spent \$0.5 Billion researching the proposal and getting the necessary licenses for the park; none of this investment can be recovered if the park is not built.
- The cost of constructing Epcot II will be \$ 1.5 billion, with \$ 1 billion to be spent at the end of the second year and \$0.5 billion at the end of the third year.

## Key Revenue Assumptions

Revenue estimates for the parks and resort properties (in millions)				
Year	Magic Kingdom	Epcot II	Resort Properties	Total
1	\$0	\$0	\$0	\$0
2	\$1,000	\$0	\$250	\$1,250
3	\$1,400	\$0	\$350	\$1,750
4	\$1,700	\$300	\$500	\$2,500
5	\$2,000	\$500	\$625	\$3,125
6	\$2,200	\$550	\$688	\$3,438
7	\$2,420	\$605	\$756	\$3,781
8	\$2,662	\$666	\$832	\$4,159
9	\$2,928	\$732	\$915	\$4,575
10	\$2,987	\$747	\$933	\$4,667

## Key Expense Assumptions

- The operating expenses are assumed to be 60% of the revenues at the parks, and 75% of revenues at the resort properties.
- Disney will also allocate corporate general and administrative costs to this project, based upon revenues; the G&A allocation will be 15% of the revenues each year. It is worth noting that a recent analysis of these expenses found that only one-third of these expenses are variable (and a function of total revenue) and that two-thirds are fixed.

## Depreciation and Capital Maintenance

Year	Depreciation as % of Book Value	Capital Maintenance as % of Depreciation
1	0.00%	0.00%
2	12.50%	50.00%
3	11.00%	60.00%
4	9.50%	70.00%
5	8.00%	80.00%
6	8.00%	90.00%
7	8.00%	100.00%
8	8.00%	105.00%
9	8.00%	110.00%
10	8.00%	110.00%

- The capital maintenance expenditures are low in the early years, when the parks are still new but increase as the parks age.

## Other Assumptions

- Disney will have to maintain non-cash working capital (primarily consisting of inventory at the theme parks and the resort properties, netted against accounts payable) of 5% of revenues, with the investments being made at the *end of each year*.
- The income from the investment will be taxed at Disney's marginal tax rate of 38%.

## Laying the groundwork: Book Capital, Working Capital and Depreciation

	0	1	2	3	4	5	6	7	8	9	10
<i>Book Value of Pre-project inv</i>	\$500	\$450	\$400	\$350	\$300	\$250	\$200	\$150	\$100	\$50	\$0
Depreciation: Pre-Project		\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50	\$50
Magic Kingdom	\$2,000	\$1,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Epcot Rio	\$0	\$0	\$1,000	\$500	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Capital Maintenance		\$0	\$188	\$252	\$276	\$258	\$285	\$314	\$330	\$347	\$350
- Depreciation on fixed assets		\$0	\$375	\$419	\$394	\$322	\$317	\$314	\$314	\$316	\$318
<b>Book Value of new Fixed Assets</b>	<b>\$2,000</b>	<b>\$3,000</b>	<b>\$3,813</b>	<b>\$4,145</b>	<b>\$4,027</b>	<b>\$3,962</b>	<b>\$3,931</b>	<b>\$3,931</b>	<b>\$3,946</b>	<b>\$3,978</b>	<b>\$4,010</b>
Book Value of Working Capital			\$63	\$88	\$125	\$156	\$172	\$189	\$208	\$229	\$233
<b>Total Capital Invested in Project</b>	<b>\$2,500</b>	<b>\$3,450</b>	<b>\$4,275</b>	<b>\$4,582</b>	<b>\$4,452</b>	<b>\$4,368</b>	<b>\$4,302</b>	<b>\$4,270</b>	<b>\$4,254</b>	<b>\$4,257</b>	<b>\$4,243</b>

12.5% of book value at end of prior year (\$3,000)



## Step 1: Estimate Accounting Earnings on Project

	0	1	2	3	4	5	6	7	8	9	10
Magic Kingdom - Revenues	\$0	\$1,000	\$1,400	\$1,700	\$2,000	\$2,200	\$2,420	\$2,662	\$2,928	\$2,987	
Epcot Rio - Revenues	\$0	\$0	\$0	\$300	\$500	\$550	\$605	\$666	\$732	\$747	
Resort & Properties - Revenues	\$0	\$250	\$350	\$500	\$625	\$688	\$756	\$832	\$915	\$933	
<b>Total Revenues</b>		<b>\$1,250</b>	<b>\$1,750</b>	<b>\$2,500</b>	<b>\$3,125</b>	<b>\$3,438</b>	<b>\$3,781</b>	<b>\$4,159</b>	<b>\$4,575</b>	<b>\$4,667</b>	
Magic Kingdom – Direct Expenses	\$0	\$600	\$840	\$1,020	\$1,200	\$1,320	\$1,452	\$1,597	\$1,757	\$1,792	
Epcot Rio – Direct Expenses	\$0	\$0	\$0	\$180	\$300	\$330	\$363	\$399	\$439	\$448	
Resort & Property – Direct Expenses	\$0	\$188	\$263	\$375	\$469	\$516	\$567	\$624	\$686	\$700	
<b>Total Direct Expenses</b>		<b>\$788</b>	<b>\$1,103</b>	<b>\$1,575</b>	<b>\$1,969</b>	<b>\$2,166</b>	<b>\$2,382</b>	<b>\$2,620</b>	<b>\$2,882</b>	<b>\$2,940</b>	
Depreciation & Amortization	\$50	\$425	\$469	\$444	\$372	\$367	\$364	\$364	\$366	\$368	
Allocated G&A Costs	\$0	\$188	\$263	\$375	\$469	\$516	\$567	\$624	\$686	\$700	
<b>Operating Income</b>		<b>(\$50)</b>	<b>(\$150)</b>	<b>(\$84)</b>	<b>\$106</b>	<b>\$315</b>	<b>\$389</b>	<b>\$467</b>	<b>\$551</b>	<b>\$641</b>	<b>\$658</b>
Taxes		(\$19)	(\$57)	(\$32)	\$40	\$120	\$148	\$178	\$209	\$244	\$250
<b>Operating Income after Taxes</b>		<b>(\$31)</b>	<b>(\$93)</b>	<b>(\$52)</b>	<b>\$66</b>	<b>\$196</b>	<b>\$241</b>	<b>\$290</b>	<b>\$341</b>	<b>\$397</b>	<b>\$408</b>

## And the Accounting View of Return

■ a

Year	After-tax Operating Income	Book value of				Average BV of Capital	ROC (a)	ROC (b)
		Pre-project investment	Fixed assets	Working capital	Total Capital			
0		\$500	\$2,000	\$0	\$2,500		NA	NA
1	-\$31	\$450	\$3,000	\$0	\$3,450	\$2,975	-1.04%	-1.24%
2	-\$93	\$400	\$3,813	\$63	\$4,275	\$3,863	-2.41%	-2.70%
3	-\$52	\$350	\$4,145	\$88	\$4,582	\$4,429	-1.18%	-1.22%
4	\$66	\$300	\$4,027	\$125	\$4,452	\$4,517	1.46%	1.44%
5	\$196	\$250	\$3,962	\$156	\$4,368	\$4,410	4.43%	4.39%
6	\$241	\$200	\$3,931	\$172	\$4,302	\$4,335	5.57%	5.52%
7	\$290	\$150	\$3,931	\$189	\$4,270	\$4,286	6.76%	6.74%
8	\$341	\$100	\$3,946	\$208	\$4,254	\$4,262	8.01%	8.00%
9	\$397	\$50	\$3,978	\$229	\$4,257	\$4,255	9.34%	9.34%
10	\$408	\$0	\$4,010	\$233	\$4,243	\$4,250	9.61%	9.59%
Average							4.05%	3.99%

- (a) Based upon average book capital over the year  
 (b) Based upon book capital at the start of each year

## What should this return be compared to?

- The computed return on capital on this investment is about 4%. To make a judgment on whether this is a sufficient return, we need to compare this return to a “hurdle rate”. Which of the following is the right hurdle rate? Why or why not?
  - The riskfree rate of 3.5% (T. Bond rate)
  - The cost of equity for Disney as a company (8.91%)
  - The cost of equity for Disney theme parks (8.20%)
  - The cost of capital for Disney as a company (7.51%)
  - The cost of capital for Disney theme parks (6.62%)
  - None of the above

## Should there be a risk premium for foreign projects?

- The exchange rate risk should be diversifiable risk (and hence should not command a premium) if
  - the company has projects in a large number of countries (or)
  - the investors in the company are globally diversified.For Disney, this risk should not affect the cost of capital used. Consequently, we would not adjust the cost of capital for Disney's investments in other mature markets (Germany, UK, France)
- The same diversification argument can also be applied against some political risk, which would mean that it too should not affect the discount rate. However, there are aspects of political risk especially in emerging markets that will be difficult to diversify and may affect the cash flows, by reducing the expected life or cash flows on the project.  
For Disney, this is the risk that we are incorporating into the cost of capital when it invests in Brazil (or any other emerging market)

## Estimating a hurdle rate for Rio Disney

- We did estimate a cost of capital of 6.62% for the Disney theme park business, using a bottom-up levered beta of 0.7829 for the business.
- This cost of equity may not adequately reflect the additional risk associated with the theme park being in an emerging market.
- The only concern we would have with using this cost of equity for this project is that it may not adequately reflect the additional risk associated with the theme park being in an emerging market (Brazil).

$$\text{Country risk premium for Brazil} = 2.50\% (34/21.5) = 3.95\%$$

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

We multiplied the default spread for Brazil (2.50%) by the relative volatility of Brazil's equity index to the Brazilian government bond. (34%/21.5%)

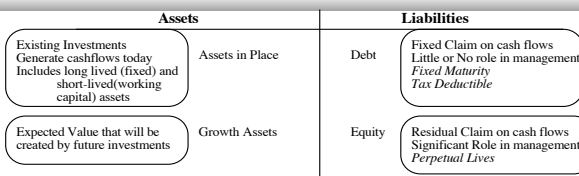
- Using this estimate of the cost of equity, Disney's theme park debt ratio of 35.32% and its after-tax cost of debt of 3.72% (see chapter 4), we can estimate the cost of capital for the project:  
$$\text{Cost of Capital in US\$} = 11.29\% (0.6468) + 3.72\% (0.3532) = 8.62\%$$

## Would lead us to conclude that...

- Do not invest in this park. The **return on capital of 4.05%** is lower than the **cost of capital for theme parks of 8.62%**; This would suggest that the project should not be taken.
- Given that we have computed the average over an arbitrary period of 10 years, while the theme park itself would have a life greater than 10 years, would you feel comfortable with this conclusion?
  - a) Yes
  - b) No

## A Tangent: From New to Existing Investments: ROC for the entire firm

How “good” are the existing investments of the firm?



Measuring ROC for existing investments..

Company	EBIT (1-t)	BV of Debt	BV of Equity	Cash	BV of Capital	Return on Capital	Cost of Capital	ROC - Cost of Capital
Disney	\$4,359	\$16,892	\$30,753	\$3,670	\$43,975	9.91%	7.51%	2.40%
Aracruz	RS 379	RS 3,090	RS 5,361	RS 22	RS 8,430	4.49%	10.63%	-6.14%
Bookscape	\$2.15	\$9.59	\$6.00	\$0.40	\$15.59	13.76%	14.90%	-1.14%
Tata Chemicals	INR 4,134	INR 12,614	INR 23,928	INR 725	INR 36,542	11.31%	11.44%	-0.12%

## Old wine in a new bottle.. Another way of presenting the same results...

- The key to value is earning excess returns. Over time, there have been attempts to restate this obvious fact in new and different ways. For instance, Economic Value Added (EVA) developed a wide following in the the 1990s:  

$$EVA = (ROC - \text{Cost of Capital}) \times (\text{Book Value of Capital Invested})$$
- The excess returns for the four firms can be restated as follows:

Company	ROC - Cost of Capital	BV of Capital	EVA
Disney	2.40%	\$43,975	\$1,057
Aracruz	-6.14%	RS 8,430	-RS 517
Bookscape	-1.14%	\$15.59	-\$0.18
Deutsche Bank	NMF	NMF	NMF
Tata Chemicals	-0.12%	INR 36,542	-INR 45

## ⌚ Application Test: Assessing Investment Quality

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

$$\text{After-tax ROC} = \text{EBIT} (1 - \text{tax rate}) / (\text{BV of debt} + \text{BV of Equity-Cash})_{\text{previous year}}$$

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

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

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

$$\text{EVA} = \text{Return Spread} * ((\text{BV of debt} + \text{BV of Equity-Cash})_{\text{previous year}})$$

## The cash flow view of this project..

	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

To get from income to cash flow, we

- added back all non-cash charges such as depreciation
- subtracted out the capital expenditures
- subtracted out the change in non-cash working capital

## The Depreciation Tax Benefit

- While depreciation reduces taxable income and taxes, it does not reduce the cash flows.
- The benefit of depreciation is therefore the tax benefit. In general, the tax benefit from depreciation can be written as:

$$\text{Tax Benefit} = \text{Depreciation} * \text{Tax Rate}$$

*Disney Theme Park: Depreciation tax savings (Tax rate = 38%)*

	1	2	3	4	5	6	7	8	9	10
Depreciation	\$50	\$425	\$469	\$444	\$372	\$367	\$364	\$364	\$366	\$368
Depreciaton * t	\$19	\$162	\$178	\$169	\$141	\$139	\$138	\$138	\$139	\$140

**Proposition 1:** The tax benefit from depreciation and other non-cash charges is greater, the higher your tax rate.

**Proposition 2:** Non-cash charges that are not tax deductible (such as amortization of goodwill) and thus provide no tax benefits have no effect on cash flows.

## Depreciation Methods

- Broadly categorizing, depreciation methods can be classified as straight line or accelerated methods. In straight line depreciation, the capital expense is spread evenly over time, In accelerated depreciation, the capital expense is depreciated more in earlier years and less in later years. Assume that you made a large investment this year, and that you are choosing between straight line and accelerated depreciation methods. Which will result in higher net income this year?

- Straight Line Depreciation
- Accelerated Depreciation

Which will result in higher cash flows this year?

- Straight Line Depreciation
- Accelerated Depreciation

## The Capital Expenditures Effect

- Capital expenditures are not treated as accounting expenses but they do cause cash outflows.
- Capital expenditures can generally be categorized into two groups
  - New (or Growth) capital expenditures are capital expenditures designed to create new assets and future growth
  - Maintenance capital expenditures refer to capital expenditures designed to keep existing assets.
- Both initial and maintenance capital expenditures reduce cash flows
- The need for maintenance capital expenditures will increase with the life of the project. In other words, a 25-year project will require more maintenance capital expenditures than a 2-year project.

## To cap ex or not to cap ex

- Assume that you run your own software business, and that you have an expense this year of \$ 100 million from producing and distribution promotional CDs in software magazines. Your accountant tells you that you can expense this item or capitalize and depreciate it over three years. Which will have a more positive effect on income?
    - a) Expense it
    - b) Capitalize and Depreciate it
- Which will have a more positive effect on cash flows?
- a) Expense it
  - b) Capitalize and Depreciate it

## The Working Capital Effect

- Intuitively, money invested in inventory or in accounts receivable cannot be used elsewhere. It, thus, represents a drain on cash flows
- To the degree that some of these investments can be financed using supplier credit (accounts payable), the cash flow drain is reduced.
- Investments in working capital are thus cash outflows
  - Any increase in working capital reduces cash flows in that year
  - Any decrease in working capital increases cash flows in that year
- To provide closure, working capital investments need to be salvaged at the end of the project life.
- **Proposition 1:** The failure to consider working capital in a capital budgeting project will overstate cash flows on that project and make it look more attractive than it really is.
- **Proposition 2:** Other things held equal, a reduction in working capital requirements will increase the cash flows on all projects for a firm.

\$ 500 million has already been spent & \$ 50 million in depreciation will exist anyway

## The incremental cash flows on the project

	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

2/3rd of allocated G&A is fixed.  
Add back this amount (1-t)  
Tax rate = 38%



## A more direct way of getting to incremental cash flows..

	0	1	2	3	4	5	6	7	8	9	10
Revenues	\$0	\$1,250	\$1,750	\$2,500	\$3,125	\$3,438	\$3,781	\$4,159	\$4,575	\$4,667	
Direct Expenses	\$0	\$788	\$1,103	\$1,575	\$1,869	\$1,766	\$2,182	\$2,202	\$2,682	\$2,940	
Incremental Depreciation	\$0	\$375	\$419	\$394	\$322	\$317	\$314	\$314	\$316	\$318	
Incremental G&A	\$0	\$63	\$88	\$125	\$156	\$172	\$189	\$208	\$229	\$233	
Incremental Operating Income	\$0	\$25	\$141	\$406	\$678	\$783	\$896	\$1,017	\$1,148	\$1,175	
- Taxes	\$0	\$10	\$53	\$154	\$258	\$298	\$340	\$386	\$436	\$447	
Incremental after-tax Operating income	\$0	\$15	\$87	\$252	\$420	\$485	\$555	\$630	\$712	\$728	
+ Incremental Depreciation	\$0	\$375	\$419	\$394	\$322	\$317	\$314	\$314	\$316	\$318	
- Capital Expenditures	\$2,000	\$1,000	\$1,188	\$752	\$276	\$258	\$283	\$314	\$330	\$347	\$350
- Change in non-cash Working Capital	\$0	\$0	\$63	\$25	\$38	\$31	\$16	\$17	\$19	\$21	\$5
Cashflow to firm	-\$2,000	-\$1,000	-\$860	\$270	\$332	\$453	\$502	\$538	\$596	\$660	\$692

## Sunk Costs

- Any expenditure that has already been incurred, and cannot be recovered (even if a project is rejected) is called a sunk cost. A test market for a consumer product and R&D expenses for a drug (for a pharmaceutical company) would be good examples.
- When analyzing a project, sunk costs should not be considered since they are not incremental.

A Behavioral Aside: It is a well established finding in psychological and behavioral research that managers find it almost impossible to ignore sunk costs.

## Test Marketing and R&D: The Quandary of Sunk Costs

- A consumer product company has spent \$ 100 million on test marketing. Looking at only the incremental cash flows (and ignoring the test marketing), the project looks like it will create \$25 million in value for the company. Should it take the investment?
  - Yes
  - No
- Now assume that every investment that this company has shares the same characteristics (Sunk costs > Value Added). The firm will clearly not be able to survive. What is the solution to this problem?

## Allocated Costs

- Firms allocate costs to individual projects from a centralized pool (such as general and administrative expenses) based upon some characteristic of the project (sales is a common choice, as is earnings)
- For large firms, these allocated costs can be significant and result in the rejection of projects
- To the degree that these costs are not incremental (and would exist anyway), this makes the firm worse off. Thus, it is only the incremental component of allocated costs that should show up in project analysis.

## Breaking out G&A Costs into fixed and variable components: A simple example

- Assume that you have a time series of revenues and G&A costs for a company.

Year	Revenues	G&A Costs
1	\$1,000	\$250
2	\$1,200	\$270
3	\$1,500	\$300

What percentage of the G&A cost is variable?

## To Time-Weighted Cash Flows

- Incremental cash flows in the earlier years are worth more than incremental cash flows in later years.
- In fact, cash flows across time cannot be added up. They have to be brought to the same point in time before aggregation.
- This process of moving cash flows through time is
  - discounting, when future cash flows are brought to the present
  - compounding, when present cash flows are taken to the future

## Present Value Mechanics

Cash Flow Type	Discounting Formula	Compounding Formula
1. Simple CF	$CF_n / (1+r)^n$	$CF_0 (1+r)^n$
2. Annuity	$A \left[ \frac{1 - \frac{1}{(1+r)^n}}{r} \right]$	$A \left[ \frac{(1+r)^n - 1}{r} \right]$
3. Growing Annuity	$A(1+g) \left[ \frac{1 - \frac{(1+g)^n}{(1+r)^n}}{r-g} \right]$	
4. Perpetuity	$A/r$	
5. Growing Perpetuity	Expected Cashflow next year/(r-g)	

## Discounted cash flow measures of return

- **Net Present Value (NPV):** The net present value is the sum of the present values of all cash flows from the project (including initial investment).

NPV = Sum of the present values of all cash flows on the project, including the initial investment, with the cash flows being discounted at the appropriate hurdle rate (cost of capital, if cash flow is cash flow to the firm, and cost of equity, if cash flow is to equity investors)

  - Decision Rule: Accept if NPV > 0
- **Internal Rate of Return (IRR):** The internal rate of return is the discount rate that sets the net present value equal to zero. It is the percentage rate of return, based upon incremental time-weighted cash flows.

  - Decision Rule: Accept if IRR > hurdle rate

## Closure on Cash Flows

- In a project with a finite and short life, you would need to compute a **salvage value**, which is the expected proceeds from selling all of the investment in the project at the end of the project life. It is usually set equal to book value of fixed assets and working capital
- In a project with an infinite or very long life, we compute cash flows for a reasonable period, and then compute a **terminal value** for this project, which is the present value of all cash flows that occur after the estimation period ends..
- Assuming the project lasts forever, and that cash flows after year 10 grow 2% (the inflation rate) forever, the present value at the end of year 10 of cash flows after that can be written as:
  - Terminal Value in year 10 =  $CF \text{ in year } 11 / (\text{Cost of Capital} - \text{Growth Rate})$   
 $= 692 (1.02) / (.0862 - .02) = \$ 10,669 \text{ million}$

## Which yields a NPV of..

Discounted at Rio Disney cost  
of capital of 8.62%

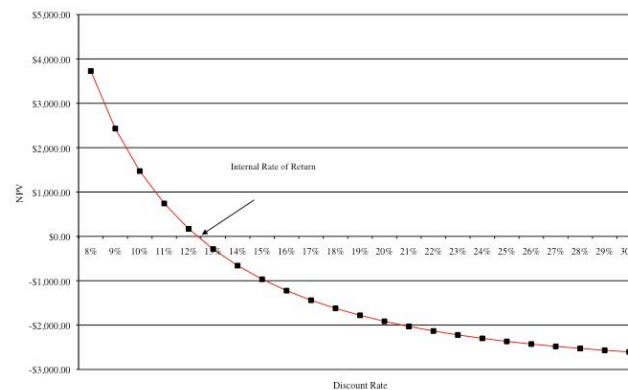
Year	Annual Cashflow	Terminal Value	Present Value
0	-\$2,000		-\$2,000
1	-\$1,000		-\$921
2	-\$860		-\$729
3	-\$270		-\$211
4	\$332		\$239
5	\$453		\$300
6	\$502		\$305
7	\$538		\$302
8	\$596		\$307
9	\$660		\$313
10	\$692	\$10,669	\$4,970
Net Present Value =			\$2,877

## Which makes the argument that..

- **The project should be accepted.** The positive net present value suggests that the project will add value to the firm, and earn a return in excess of the cost of capital.
- By taking the project, Disney will increase its value as a firm by \$2,877 million.

## The IRR of this project

Figure 5.5: NPV Profile for Disney Theme Park



## The IRR suggests..

- **The project is a good one.** Using time-weighted, incremental cash flows, this project provides a return of 12.35%. This is greater than the cost of capital of 8.62%.
- The IRR and the NPV will yield **similar results** most of the time, though there are differences between the two approaches that may cause project rankings to vary depending upon the approach used.

## 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 Reals?
  - a) Yes
  - b) No

## The “Consistency Rule” for Cash Flows

- The cash flows on a project and the discount rate used should be defined in the same terms.
  - If cash flows are in dollars (\$R), the discount rate has to be a dollar (\$R) discount rate
  - If the cash flows are nominal (real), the discount rate has to be nominal (real).
- If consistency is maintained, the project conclusions should be identical, no matter what cash flows are used.

## Disney Theme Park: Project Analysis in \$R

- The inflation rates were assumed to be 7% in Brazil and 2% in the United States. The \$R/dollar rate at the time of the analysis was 2.04 \$R/dollar.
- The expected exchange rate was derived assuming purchasing power parity.  
Expected Exchange Rate<sub>t</sub> = Exchange Rate today \* (1.07/1.02)<sup>t</sup>
- The expected growth rate after year 10 is still expected to be the inflation rate, but it is the 7% \$R inflation rate.
- The cost of capital in \$R was derived from the cost of capital in dollars and the differences in inflation rates:

$$\begin{aligned} \text{\$R Cost of Capital} &= (1 + \text{US \$ Cost of Capital}) \frac{(1 + \text{Exp Inflation}_{\text{Brazil}})}{(1 + \text{Exp Inflation}_{\text{US}})} - 1 \\ &= (1.0862) (1.07/1.02) - 1 = 13.94\% \end{aligned}$$



## Disney Theme Park: \$R NPV

Discount  
back at  
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

## Uncertainty in Project Analysis: What can we do?

- Based on our expected cash flows and the estimated cost of capital, the proposed theme park looks like a very good investment for Disney. Which of the following may affect your assessment of value?
  - a) Revenues may be over estimated (crowds may be smaller and spend less)
  - b) Actual costs may be higher than estimated costs
  - c) Tax rates may go up
  - d) Interest rates may rise
  - e) Risk premiums and default spreads may increase
  - f) All of the above
- How would you respond to this uncertainty?
  - a) Will wait for the uncertainty to be resolved
  - b) Will not take the investment
  - c) Ignore it.
  - d) Other

## One simplistic (but effective) solution: See how quickly you can get your money back...

- If your biggest fear is losing the billions that you invested in the project, one simple measure that you can compute is the number of years it will take you to get your money back.

Year	Cash Flow	Cumulated CF	PV of Cash Flow	Cumulated DCF
0	-\$2,000	-\$2,000	-\$2,000	-\$2,000
1	-\$1,000	-\$3,000	-\$921	-\$2,921
2	-\$860	-\$3,860	-\$729	-\$3,649
3	-\$270	-\$4,130	-\$211	-\$3,860
4	\$332	-\$3,797	\$239	-\$3,621
5	\$453	-\$3,344	\$300	-\$3,321
6	\$502	-\$2,842	\$305	-\$3,016
7	\$538	-\$2,304	\$302	-\$2,714
8	\$596	-\$1,708	\$307	-\$2,407
9	\$660	-\$1,049	\$313	-\$2,093
10	\$692	-\$357	\$303	-\$1,790
11	\$706	\$350	\$284	-\$1,506
12	\$720	\$1,070	\$267	-\$1,239
13	\$735	\$1,804	\$251	-\$988
14	\$749	\$2,554	\$236	-\$753
15	\$764	\$3,318	\$221	-\$531
16	\$780	\$4,097	\$208	-\$324
17	\$795	\$4,892	\$195	-\$129
18	\$811	\$5,703	\$183	\$55
19	\$827	\$6,531	\$172	\$227
20	\$844	\$7,374	\$162	\$388

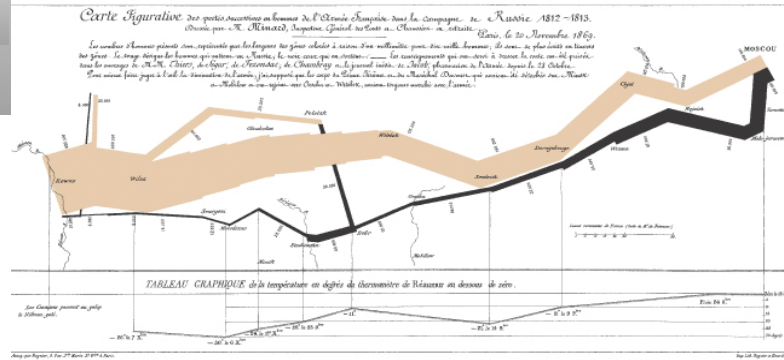
Payback = 10.5 years →

Discounted Payback  
= 17.7 years

## A slightly more sophisticated approach: 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).

And here is a really good picture...



The final step up: Incorporate probabilistic estimates.. Rather than expected values..

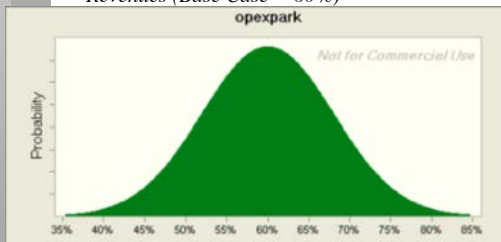
Actual Revenues as % of Forecasted Revenues (Base case = 100%)



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

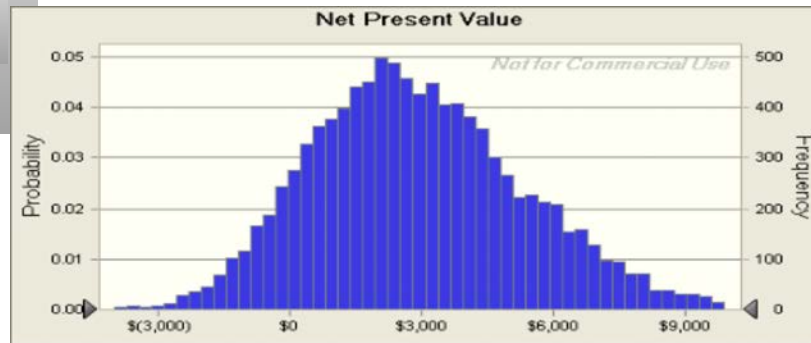


Operating Expenses at Parks as % of Revenues (Base Case = 60%)



## The resulting simulation...

Average = \$2.95 billion  
Median = \$2.73 billion



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

## You are the decision maker...

- Assume that you are the person at Disney who is given the results of the simulation. The average and median NPV are close to your base case values of \$2.877 billion. However, there is a 12% probability that the project could have a negative NPV and that the NPV could be a large negative value? How would you use this information?
  - a) I would accept the investment and print the results of this simulation and file them away to show that I exercised due diligence.
  - b) I would reject the investment, because 12% is higher than my threshold value for losing on a project.
  - c) Other

## Equity Analysis: The Parallels

- The investment analysis can be done entirely in equity terms, as well. The returns, cashflows and hurdle rates will all be defined from the perspective of equity investors.
- If using accounting returns,
  - Return will be Return on Equity (ROE) = Net Income/BV of Equity
  - ROE has to be greater than cost of equity
- If using discounted cashflow models,
  - Cashflows will be cashflows after debt payments to equity investors
  - Hurdle rate will be cost of equity

## A Brief Example: A Paper Plant for Aracruz - Investment Assumptions

- The plant is expected to have a capacity of 750,000 tons and will have the following characteristics:
- It will require an initial investment of 250 Million BR. At the end of the fifth year, an additional investment of 50 Million BR will be needed to update the plant.
- Aracruz plans to borrow 100 Million BR, at a real interest rate of 6.3725%, using a 10-year term loan (where the loan will be paid off in equal annual increments).
- The plant will have a life of 10 years. During that period, the plant (and the additional investment in year 5) will be depreciated using double declining balance depreciation, with a life of 10 years. At the end of the tenth year, the plant is expected to be sold for its remaining book value.

## Operating Assumptions

- The plant will be partly in commission in a couple of months, but will have a capacity of only 650,000 tons in the first year, 700,000 tons in the second year before getting to its full capacity of 750,000 tons in the third year.
- The capacity utilization rate will be 90% for the first 3 years, and rise to 95% after that.
- The price per ton of linerboard is currently \$400, and is expected to keep pace with inflation for the life of the plant.
- The variable cost of production, primarily labor and material, is expected to be 55% of total revenues; there is a fixed cost of 50 Million BR, which will grow at the inflation rate.
- The working capital requirements are estimated to be 15% of total revenues, and the investments have to be made at the beginning of each year. At the end of the tenth year, it is anticipated that the entire working capital will be salvaged.

## The Hurdle Rate

- The analysis is done in real terms and to equity investors. Thus, the hurdle rate has to be a real cost of equity.
- In the earlier section, we estimated costs of equity, debt and capital in US dollars, \$R and real terms for Aracruz's paper business.

	Cost of equity	Pre-tax Cost of debt	After-tax cost of debt	D/(D+E)	Cost of capital
US dollars	20.82%	8.50%	5.61%	52.47%	12.84%
\$R	26.75%	13.82%	10.79%	52.47%	18.37%
Real	18.45%	6.3725%	3.54%	52.47%	10.63%

## Breaking down debt payments by year

Year	Beginning Debt	Interest expense	Principal Repaid	Total Payment	Ending Debt
1	R\$ 100,000	R\$ 6,373	R\$ 7,455	R\$ 13,828	R\$ 92,545
2	R\$ 92,545	R\$ 5,897	R\$ 7,930	R\$ 13,828	R\$ 84,615
3	R\$ 84,615	R\$ 5,392	R\$ 8,436	R\$ 13,828	R\$ 76,179
4	R\$ 76,179	R\$ 4,855	R\$ 8,973	R\$ 13,828	R\$ 67,206
5	R\$ 67,206	R\$ 4,283	R\$ 9,545	R\$ 13,828	R\$ 57,661
6	R\$ 57,661	R\$ 3,674	R\$ 10,153	R\$ 13,828	R\$ 47,508
7	R\$ 47,508	R\$ 3,027	R\$ 10,800	R\$ 13,828	R\$ 36,708
8	R\$ 36,708	R\$ 2,339	R\$ 11,488	R\$ 13,828	R\$ 25,220
9	R\$ 25,220	R\$ 1,607	R\$ 12,220	R\$ 13,828	R\$ 12,999
10	R\$ 12,999	R\$ 828	R\$ 12,999	R\$ 13,828	R\$ 0

## Net Income: Paper Plant

	1	2	3	4	5	6	7	8	9	10
Capacity (in '000s)	650	700	750	750	750	750	750	750	750	750
Utilization Rate	90%	90%	90%	95%	95%	95%	95%	95%	95%	95%
Production Rate (in '000)	585	630	675	713	713	713	713	713	713	713
Price per ton	400	400	400	400	400	400	400	400	400	400
Revenues (in Real BR 0)	R\$ 234,000	R\$ 252,000	R\$ 270,000	R\$ 285,000	R\$ 285,000	R\$ 285,000	R\$ 285,000	R\$ 285,000	R\$ 285,000	R\$ 285,000
- Direct Expenses	R\$ 155,300	R\$ 163,400	R\$ 171,500	R\$ 178,250	R\$ 178,250	R\$ 178,250	R\$ 178,250	R\$ 178,250	R\$ 178,250	R\$ 178,250
- Depreciation	R\$ 35,000	R\$ 28,000	R\$ 22,400	R\$ 17,920	R\$ 14,336	R\$ 21,469	R\$ 21,469	R\$ 21,469	R\$ 21,469	R\$ 21,469
<b>Operating Income</b>	<b>R\$ 43,700</b>	<b>R\$ 60,600</b>	<b>R\$ 76,100</b>	<b>R\$ 88,830</b>	<b>R\$ 92,414</b>	<b>R\$ 85,281</b>	<b>R\$ 85,281</b>	<b>R\$ 85,281</b>	<b>R\$ 85,281</b>	<b>R\$ 85,281</b>
- Interest Expenses	R\$ 6,373	R\$ 5,897	R\$ 5,392	R\$ 4,855	R\$ 4,283	R\$ 3,674	R\$ 3,027	R\$ 2,339	R\$ 1,607	R\$ 828
Taxable Income	R\$ 37,327	R\$ 54,703	R\$ 70,708	R\$ 83,975	R\$ 88,131	R\$ 81,607	R\$ 82,254	R\$ 82,942	R\$ 83,674	R\$ 84,453
- Taxes	R\$ 12,691	R\$ 18,599	R\$ 24,041	R\$ 28,552	R\$ 29,965	R\$ 27,746	R\$ 27,966	R\$ 28,200	R\$ 28,449	R\$ 28,714
<b>Net Income</b>	<b>R\$ 24,636</b>	<b>R\$ 36,104</b>	<b>R\$ 46,667</b>	<b>R\$ 55,424</b>	<b>R\$ 58,167</b>	<b>R\$ 53,860</b>	<b>R\$ 54,287</b>	<b>R\$ 54,742</b>	<b>R\$ 55,225</b>	<b>R\$ 55,739</b>

## A ROE Analysis

Year	Net Income	Beg. BV: Assets	Depreciation	Capital Exp.	Ending BV: Assets	BV of Working Capital	Debt	BV: Equity	Average BV: Equity	ROE
0	RS 0	RS 0	RS 0	RS 250,000	RS 250,000	RS 35,100	RS 100,000	RS 185,100		
1	RS 24,636	RS 250,000	RS 35,000	RS 0	RS 215,000	RS 37,800	RS 92,545	RS 160,255	RS 172,678	14.27%
2	RS 36,104	RS 215,000	RS 28,000	RS 0	RS 187,000	RS 40,500	RS 84,615	RS 142,885	RS 151,570	23.82%
3	RS 46,667	RS 187,000	RS 22,400	RS 0	RS 164,600	RS 42,750	RS 76,179	RS 131,171	RS 137,028	34.06%
4	RS 55,424	RS 164,600	RS 17,920	RS 0	RS 146,680	RS 42,750	RS 67,206	RS 122,224	RS 126,697	43.75%
5	RS 58,167	RS 146,680	RS 14,336	RS 50,000	RS 182,344	RS 42,750	RS 57,661	RS 167,433	RS 144,828	40.16%
6	RS 53,860	RS 182,344	RS 21,469	RS 0	RS 160,875	RS 42,750	RS 47,508	RS 156,117	RS 161,775	33.29%
7	RS 54,287	RS 160,875	RS 21,469	RS 0	RS 139,406	RS 42,750	RS 36,708	RS 145,448	RS 150,783	36.00%
8	RS 54,742	RS 139,406	RS 21,469	RS 0	RS 117,938	RS 42,750	RS 25,220	RS 135,468	RS 140,458	38.97%
9	RS 55,225	RS 117,938	RS 21,469	RS 0	RS 96,469	RS 42,750	RS 12,999	RS 126,220	RS 130,844	42.21%
10	RS 55,739	RS 96,469	RS 21,469	RS 0	RS 75,000	RS 0	RS 0	RS 75,000	RS 100,610	55.40%
										36.19%

Real ROE of 36.19% is greater than  
Real Cost of Equity of 18.45%

## From Project ROE to Firm ROE

- As with the earlier analysis, where we used return on capital and cost of capital to measure the overall quality of projects at firms, we can compute return on equity and cost of equity to pass judgment on whether firms are creating value to its equity investors.

### Equity Excess Returns and EVA: 2008

Company	Net Income	BV of Equity	ROE	Cost of Equity	ROE - Cost of Equity	Equity EVA
Disney	\$4,427	\$30,753	14.40%	8.91%	5.49%	\$1,688.34
Aracruz	-\$ 4,213	5361	-78.59%	18.45%	-97.05%	(\$5,202.85)
Bookscape	\$1.50	\$6.00	25.00%	20.94%	4.06%	\$0.24
Deutsche Bank	-€ 3,835.00	€ 38,466.00	-9.97%	10.72%	-20.69%	(\$7,958.62)
Tata Chemicals	INR 9,644	23,928	40.30%	13.93%	26.37%	\$6,309.81
Tata Chemicals(w/o extraordinary loss)	INR 3,700	23928	15.46%	13.93%	1.53%	\$366.10



## An Incremental CF Analysis

	0	1	2	3	4	5	6	7	8	9	10
Net Income		R\$ 24,636	R\$ 36,104	R\$ 46,667	R\$ 55,424	R\$ 58,167	R\$ 53,860	R\$ 54,287	R\$ 54,742	R\$ 55,225	R\$ 55,739
+ Depreciation & Amortization		R\$ 35,000	R\$ 28,000	R\$ 22,400	R\$ 17,920	R\$ 14,336	R\$ 21,469	R\$ 21,469	R\$ 21,469	R\$ 21,469	R\$ 21,469
- Capital Expenditures	R\$ 150,000	R\$ 0	R\$ 0	R\$ 0	R\$ 0	R\$ 50,000	R\$ 0	R\$ 0	R\$ 0	R\$ 0	R\$ 0
- Change in Working Capital	R\$ 35,100	R\$ 2,700	R\$ 2,700	R\$ 2,250	R\$ 0	R\$ 0	R\$ 0	R\$ 0	R\$ 0	R\$ 0	-R\$ 42,750
- Principal Repayments		R\$ 7,455	R\$ 7,930	R\$ 8,436	R\$ 8,973	R\$ 9,545	R\$ 10,153	R\$ 10,800	R\$ 11,488	R\$ 12,220	R\$ 12,999
Cashflow to Equity	-R\$ 185,100	R\$ 49,481	R\$ 53,474	R\$ 58,382	R\$ 64,371	R\$ 12,958	R\$ 65,176	R\$ 64,956	R\$ 64,722	R\$ 64,473	R\$ 106,958

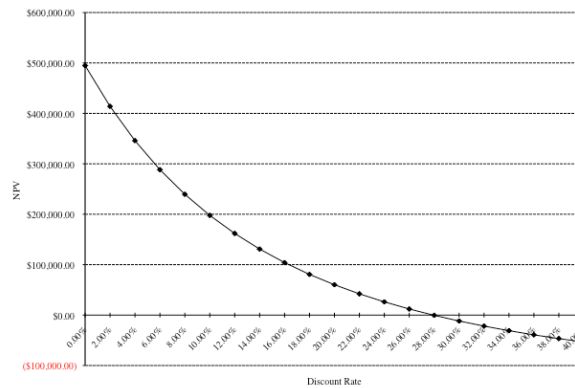
## An Equity NPV

Discounted at real  
cost of equity of  
18.45%

Year	FCFE	PV of FCFE
0	(185,100 BR)	(185,100 BR)
1	49,481 BR	41,773 BR
2	53,474 BR	38,110 BR
3	58,382 BR	35,126 BR
4	64,371 BR	32,696 BR
5	12,958 BR	5,556 BR
6	65,176 BR	23,594 BR
7	64,956 BR	19,851 BR
8	64,722 BR	16,698 BR
9	64,473 BR	14,043 BR
10	181,958 BR	33,458 BR
NPV		75,806 BR

## An Equity IRR

Figure 5.6: NPV Profile on Equity Investment in Paper Plant: Aracruz

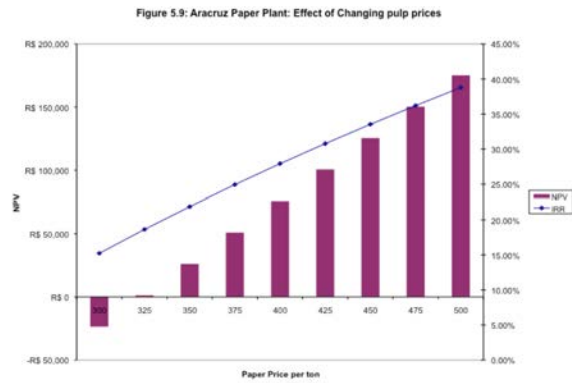


## Real versus Nominal Analysis

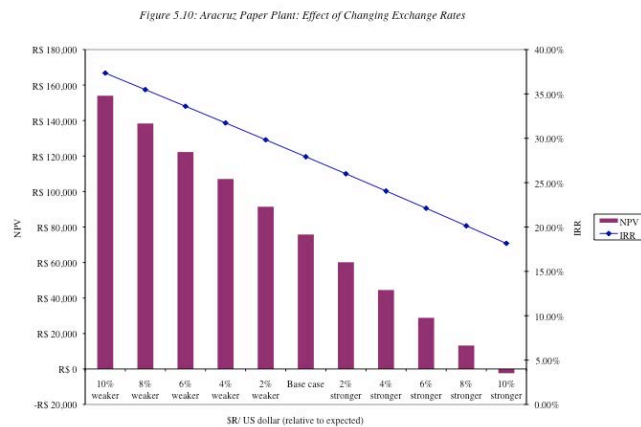
- In computing the NPV of the plant, we estimated real cash flows and discounted them at the real cost of equity. We could have estimated the cash flows in nominal terms (either US dollars or \$R) and discounted them at a nominal cost of equity (either US dollar or \$R). Would the answer be different?
  - a) Yes
  - b) NoExplain

## Dealing with Macro Uncertainty: The Effect of Paper Prices..

- Like the Disney Theme Park, the Aracruz paper plant's actual value will be buffeted as the variables change. The biggest source of variability is an external factor –the price of paper and pulp.



## And Exchange Rates...



## Should you hedge?

- The value of this plant is very much a function of paper and pulp prices. There are futures, forward and option markets on paper and pulp that Aracruz can use to hedge against paper price movements. Should it?
  - a) Yes
  - b) NoExplain.
- The value of the plant is also a function of exchange rates. There are forward, futures and options markets on currency. Should Aracruz hedge against exchange rate risk?
  - a) Yes
  - b) NoExplain.

## Acquisitions and Projects

- An acquisition is an investment/project like any other and all of the rules that apply to traditional investments should apply to acquisitions as well. In other words, for an acquisition to make sense:
  - It should have positive NPV. The present value of the expected cash flows from the acquisition should exceed the price paid on the acquisition.
  - The IRR of the cash flows to the firm (equity) from the acquisition  $>$  Cost of capital (equity) on the acquisition
- In estimating the cash flows on the acquisition, we should count in any possible cash flows from synergy.
- The discount rate to assess the present value should be based upon the risk of the investment (target company) and not the entity considering the investment (acquiring company).

## Tata Chemicals and Sensient Technologies

- Sensient Technologies is a publicly traded US firm that manufactures color, flavor and fragrance additives for the food business. Tata Chemicals is an Indian company that manufactures fertilizers and chemicals.
- Based upon 2008 financial statements, the firm reported
  - Operating income of \$162 million on revenues of \$1.23 billion for the year
  - A tax rate of 37% of its income as taxes in 2008
  - Depreciation of \$44 million and capital expenditures of \$54 million.
  - An Increase in Non-cash working capital of \$16 million during the year.
- Sensient currently has a debt to capital ratio of 28.57% (translating into a debt to equity ratio of 40%) and faces a pre-tax cost of debt of 5.5%.

## Estimating the Cost of Capital for the Acquisition

- In assessing the cost of capital for the acquisition, we will
  - Estimate all values in US dollar terms (rather than rupees)
  - Use Sensient's risk, debt and tax characteristics in making our assessments.
- While Sensient Technologies is classified as a specialty chemical company, its revenues are derived almost entirely from the food processing business. Consequently, we feel that the unlevered beta of food processing companies in the United States is a better measure of risk; in January 2009, we estimated an unlevered beta of 0.65 for this sector.
- Using the US corporate tax rate of 37% (to reflect the fact that Sensient's income will be taxed in the US), Sensient's current debt to capital ratio of 28.57% (D/E=40%) and its pre-tax cost of debt of 5.5%:
  - Levered Beta =  $0.65 (1 + (1-.37) (.40)) = 0.8138$
  - Cost of Equity =  $3.5\% + 0.8138 (6\%) = 8.38\%$
  - Cost of capital =  $8.38\% (1-.2857) + 5.5\% (1-.37) (.2857) = 6.98\%$

## Estimating the Cash Flow to the Firm and Growth for Sensient

- Using the operating income (\$162 million), capital expenditures (\$54 million), depreciation (\$44 million) and increase in non-cash working capital (\$16 million), we estimate the cash flow to the firm for Sensient Technologies in 2008 :
  - Cash Flow to the firm = After-tax Operating Income + Depreciation – Capital Expenditures – Change in Non-cash Working Capital = 162 (1-.37) + 44 – 54 – 16 = \$76.06 million
- We will assume that the firm is mature and that all of the inputs to this computation – earnings, capital expenditures, depreciation and working capital – will grow 2% a year in perpetuity.

## Value of Sensient Technologies: Before Synergy

- We can estimate the value of the firm, based on these inputs:
 

Value of Operating Assets	$\frac{\text{Expected Cashflow to the firm next year}}{(\text{Cost of Capital} - \text{Stable growth rate})}$
	$\frac{\$76.06 (1.02)}{(.0698 - .02)} = \$1,559 \text{ million}$
- Adding the cash balance of the firm (\$8 million) and subtracting out the existing debt (\$460 million) yields the value of equity in the firm:
 

Value of Equity	= Value of Operating Assets + Cash – Debt
	= \$1,559 + \$ 8 - \$460 million = \$1,107 million
- The market value of equity in Sensient Technologies in May 2009 was \$1,150 million.
- To the extent that Tata Chemicals pays the market price, it will have to generate benefits from synergy that exceed \$43 million.

## Measuring Investment Returns

### II. Investment Interactions, Options and Remorse...

### Independent investments are the exception...

- In all of the examples we have used so far, the investments that we have analyzed have stood alone. Thus, our job was a simple one. Assess the expected cash flows on the investment and discount them at the right discount rate.
- In the real world, most investments are not independent. Taking an investment can often mean rejecting another investment at one extreme (mutually exclusive) to being locked in to take an investment in the future (pre-requisite).
- More generally, accepting an investment can create side costs for a firm's existing investments in some cases and benefits for others.

## I. Mutually Exclusive Investments

- We have looked at how best to assess a stand-alone investment and concluded that a good investment will have positive NPV and generate accounting returns (ROC and ROE) and IRR that exceed your costs (capital and equity).
- In some cases, though, firms may have to choose between investments because
  - They are mutually exclusive: Taking one investment makes the other one redundant because they both serve the same purpose
  - The firm has limited capital and cannot take every good investment (i.e., investments with positive NPV or high IRR).
- Using the two standard discounted cash flow measures, NPV and IRR, can yield different choices when choosing between investments.

## Comparing Projects with the same (or similar) lives..

- When comparing and choosing between investments with the same lives, we can
  - Compute the accounting returns (ROC, ROE) of the investments and pick the one with the higher returns
  - Compute the NPV of the investments and pick the one with the higher NPV
  - Compute the IRR of the investments and pick the one with the higher IRR
- While it is easy to see why accounting return measures can give different rankings (and choices) than the discounted cash flow approaches, you would expect NPV and IRR to yield consistent results since they are both time-weighted, incremental cash flow return measures.

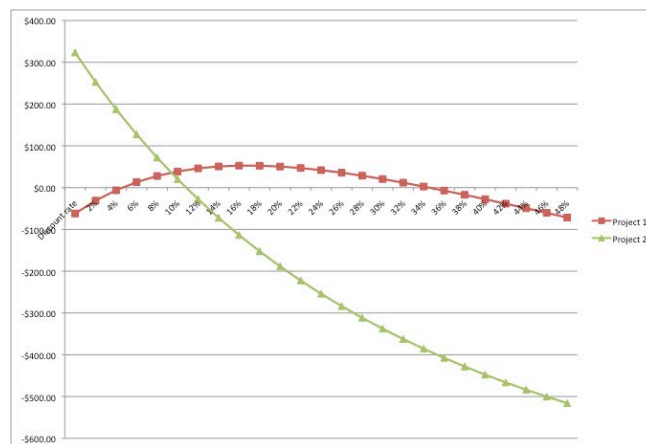


## Case 1: IRR versus NPV

- Consider two projects with the following cash flows:

Year	Project 1 CF	Project 2 CF
0	-1000	-1000
1	800	200
2	1000	300
3	1300	400
4	-2200	500

## Project's NPV Profile



## What do we do now?

- Project 1 has two internal rates of return. The first is 6.60%, whereas the second is 36.55%. Project 2 has one internal rate of return, about 12.8%.
  - Why are there two internal rates of return on project 1?
  
  - If your cost of capital is 12%, which investment would you accept?
    - a) Project 1
    - b) Project 2
- Explain.

## Case 2: NPV versus IRR

<i>Project A</i>				
Cash Flow	\$ 350,000	\$ 450,000	\$ 600,000	\$ 750,000
Investment	\$ 1,000,000			
	NPV = \$467,937			
	IRR = 33.66%			
<i>Project B</i>				
Cash Flow	\$ 3,000,000	\$ 3,500,000	\$ 4,500,000	\$ 5,500,000
Investment	\$ 10,000,000			
	NPV = \$1,358,664			
	IRR = 20.88%			

## Which one would you pick?

- Assume that you can pick only one of these two projects. Your choice will clearly vary depending upon whether you look at NPV or IRR. You have enough money currently on hand to take either. Which one would you pick?
  - a) Project A. It gives me the bigger bang for the buck and more margin for error.
  - b) Project B. It creates more dollar value in my business.

If you pick A, what would your biggest concern be?

If you pick B, what would your biggest concern be?

## Capital Rationing, Uncertainty and Choosing a Rule

- If a business has limited access to capital, has a stream of surplus value projects and faces more uncertainty in its project cash flows, it is much more likely to use IRR as its decision rule.

Small, high-growth companies and private businesses are much more likely to use IRR.
- If a business has substantial funds on hand, access to capital, limited surplus value projects, and more certainty on its project cash flows, it is much more likely to use NPV as its decision rule.

As firms go public and grow, they are much more likely to gain from using NPV.

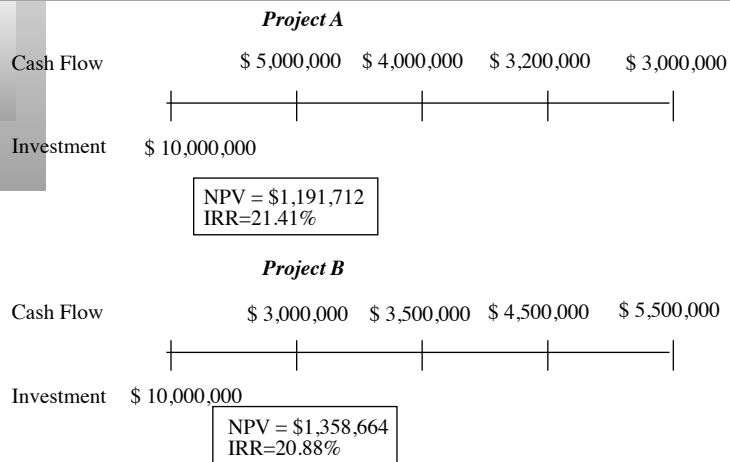
## The sources of capital rationing...

<i>Cause</i>	<i>Number of firms</i>	<i>Percent of total</i>
Debt limit imposed by outside agreement	10	10.7
Debt limit placed by management external to firm	3	3.2
Limit placed on borrowing by internal management	65	69.1
Restrictive policy imposed on retained earnings	2	2.1
Maintenance of target EPS or PE ratio	14	14.9

## An Alternative to IRR with Capital Rationing

- The problem with the NPV rule, when there is capital rationing, is that it is a dollar value. It measures success in absolute terms.
- The NPV can be converted into a relative measure by dividing by the initial investment. This is called the profitability index.
  - Profitability Index (PI) = NPV/Initial Investment
- In the example described, the PI of the two projects would have been:
  - PI of Project A =  $\$467,937/1,000,000 = 46.79\%$
  - PI of Project B =  $\$1,358,664/10,000,000 = 13.59\%$Project A would have scored higher.

### Case 3: NPV versus IRR



### Why the difference?

These projects are of the same scale. Both the NPV and IRR use time-weighted cash flows. Yet, the rankings are different. Why?

Which one would you pick?

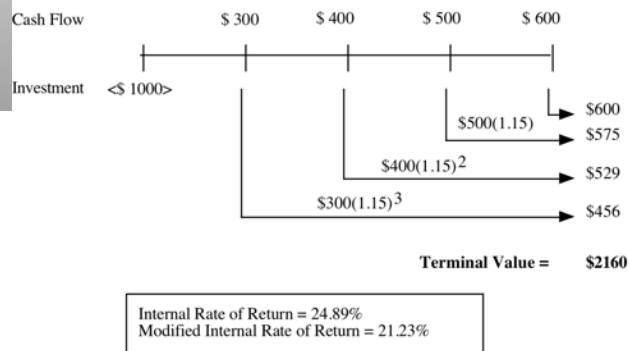
- a) Project A. It gives me the bigger bang for the buck and more margin for error.
- b) Project B. It creates more dollar value in my business.

## NPV, IRR and the Reinvestment Rate Assumption

- The NPV rule assumes that intermediate cash flows on the project get reinvested at the hurdle rate (which is based upon what projects of comparable risk should earn).
- The IRR rule assumes that intermediate cash flows on the project get reinvested at the IRR. Implicit is the assumption that the firm has an infinite stream of projects yielding similar IRRs.
- Conclusion: When the IRR is high (the project is creating significant surplus value) and the project life is long, the IRR will overstate the true return on the project.

## Solution to Reinvestment Rate Problem

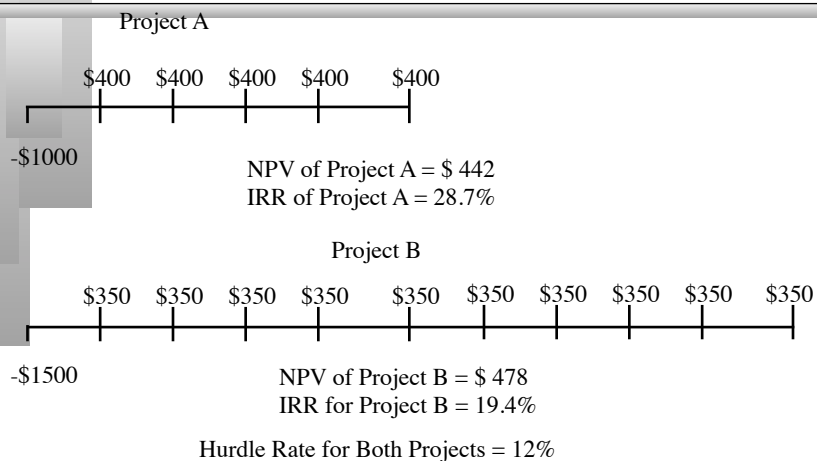
Figure 6.3: IRR versus Modified Internal Rate of Return



## Why NPV and IRR may differ.. Even if projects have the same lives

- A project can have only one NPV, whereas it can have more than one IRR.
- The NPV is a dollar surplus value, whereas the IRR is a percentage measure of return. The NPV is therefore likely to be larger for “large scale” projects, while the IRR is higher for “small-scale” projects.
- The NPV assumes that intermediate cash flows get reinvested at the “hurdle rate”, which is based upon what you can make on investments of comparable risk, while the IRR assumes that intermediate cash flows get reinvested at the “IRR”.

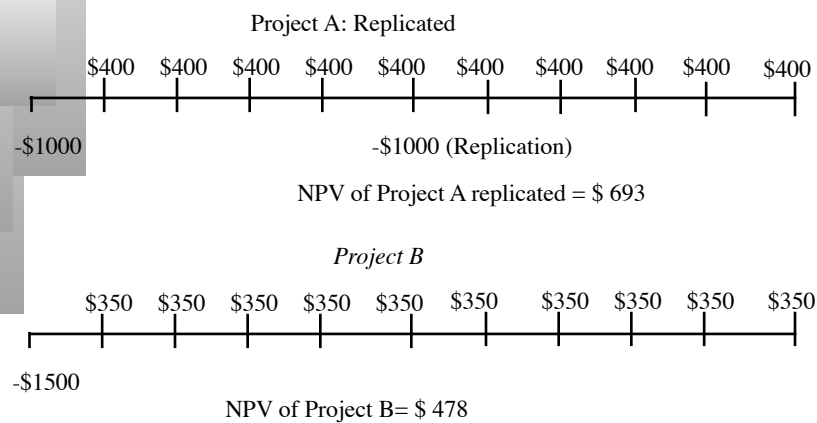
## Comparing projects with different lives..



## Why NPVs cannot be compared.. When projects have different lives.

- The net present values of mutually exclusive projects with different lives cannot be compared, since there is a bias towards longer-life projects. To compare the NPV, we have to
  - replicate the projects till they have the same life (or)
  - convert the net present values into annuities
- The IRR is unaffected by project life. We can choose the project with the higher IRR.

## Solution 1: Project Replication





## Solution 2: Equivalent Annuities

- Equivalent Annuity for 5-year project  
=  $\$442 * PV(A, 12\%, 5 \text{ years})$   
= \$ 122.62
- Equivalent Annuity for 10-year project  
=  $\$478 * PV(A, 12\%, 10 \text{ years})$   
= \$ 84.60

## What would you choose as your investment tool?

- Given the advantages/disadvantages outlined for each of the different decision rules, which one would you choose to adopt?
  - a) Return on Investment (ROE, ROC)
  - b) Payback or Discounted Payback
  - c) Net Present Value
  - d) Internal Rate of Return
  - e) Profitability Index
- Do you think your choice has been affected by the events of the last quarter of 2008? If so, why? If not, why not?

## What firms actually use ..

<i>Decision Rule</i>	<i>% of Firms using as primary decision rule in</i>		
	<i>1998</i>	<i>1976</i>	<i>1986</i>
IRR	53.6%	49.0%	42.0%
Accounting Return	25.0%	8.0%	7.0%
NPV	9.8%	21.0%	34.0%
Payback Period	8.9%	19.0%	14.0%
Profitability Index	2.7%	3.0%	3.0%

## II. Side Costs and Benefits

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

## A. Opportunity Cost

- An opportunity cost arises when a project uses a resource that may already have been paid for by the firm.
- When a resource that is already owned by a firm is being considered for use in a project, this resource has to be priced on its next best alternative use, which may be
  - a sale of the asset, in which case the opportunity cost is the expected proceeds from the sale, net of any capital gains taxes
  - renting or leasing the asset out, in which case the opportunity cost is the expected present value of the after-tax rental or lease revenues.
  - use elsewhere in the business, in which case the opportunity cost is the cost of replacing it.

## Case 1: Foregone Sale?

- Assume that Disney owns land in Rio already. This land is undeveloped and was acquired several years ago for \$ 5 million for a hotel that was never built. It is anticipated, if this theme park is built, that this land will be used to build the offices for Disney Rio. The land currently can be sold for \$ 40 million, though that would create a capital gain (which will be taxed at 20%). In assessing the theme park, which of the following would you do:
  - a) Ignore the cost of the land, since Disney owns its already
  - b) Use the book value of the land, which is \$ 5 million
  - c) Use the market value of the land, which is \$ 40 million
  - d) Other:

## Case 2: Incremental Cost? An Online Retailing Venture for Bookscape

- The initial investment needed to start the service, including the installation of additional phone lines and computer equipment, will be \$1 million. These investments are expected to have a life of four years, at which point they will have no salvage value. The investments will be depreciated straight line over the four-year life.
- The revenues in the first year are expected to be \$1.5 million, growing 20% in year two, and 10% in the two years following.
- The salaries and other benefits for the employees are estimated to be \$150,000 in year one, and grow 10% a year for the following three years.
- The cost of the books will be 60% of the revenues in each of the four years.
- The working capital, which includes the inventory of books needed for the service and the accounts receivable will be 10% of the revenues; the investments in working capital have to be made at the beginning of each year. At the end of year 4, the entire working capital is assumed to be salvaged.
- The tax rate on income is expected to be 40%.

## Cost of capital for investment

- We will re-estimate the beta for this online project by looking at publicly traded Internet retailers. The unlevered total beta of internet retailers is 4.25, and we assume that this project will be funded with the same mix of debt and equity (D/E = 53.47%, Debt/Capital = 34.84%) that Bookscape uses in the rest of the business. We will assume that Bookscape's tax rate (40%) and pretax cost of debt (6%) apply to this project.

$$\text{Levered Beta}_{\text{Online Service}} = 4.25 [1 + (1 - 0.4) (0.5357)] = 5.61$$

$$\text{Cost of Equity}_{\text{Online Service}} = 3.5\% + 5.61 (6\%) = 37.18\%$$

$$\text{Cost of Capital}_{\text{Online Service}} = 37.18\% (0.6516) + 6\% (1 - 0.4) (0.3484) = 25.48\%$$

## Incremental Cash flows on Investment

	0	1	2	3	4
<i>Revenues</i>		\$1,500,000	\$1,800,000	\$1,980,000	\$2,178,000
<i>Operating Expenses</i>					
Labor		\$150,000	\$165,000	\$181,500	\$199,650
Materials		\$900,000	\$1,080,000	\$1,188,000	\$1,306,800
Depreciation		\$250,000	\$250,000	\$250,000	\$250,000
Operating Income		\$200,000	\$305,000	\$360,500	\$421,550
Taxes		\$80,000	\$122,000	\$144,200	\$168,620
After-tax Operating Income		\$120,000	\$183,000	\$216,300	\$252,930
+ Depreciation		\$250,000	\$250,000	\$250,000	\$250,000
- Change in Working Capital	\$150,000	\$30,000	\$18,000	\$19,800	-\$217,800
+ Salvage Value of Investment					\$0
ATCF	-\$1,150,000	\$340,000	\$415,000	\$446,500	\$720,730
Present Value	-\$1,150,000	\$270,957	\$263,568	\$225,989	\$290,710

NPV of investment = -\$98,775

## The side costs...

- It is estimated that the additional business associated with online ordering and the administration of the service itself will add to the workload for the current general manager of the bookstore. As a consequence, the salary of the general manager will be increased from \$100,000 to \$120,000 next year; it is expected to grow 5 percent a year after that for the remaining three years of the online venture. After the online venture is ended in the fourth year, the manager's salary will revert back to its old levels.
- It is also estimated that Bookscape Online will utilize an office that is currently used to store financial records. The records will be moved to a bank vault, which will cost \$1000 a year to rent.

## NPV with side costs...

### Additional salary costs

	1	2	3	4	Total
Increase in Salary	\$20,000	\$21,000	\$22,050	\$23,153	
After-tax expense	\$12,000	\$12,600	\$13,230	\$13,892	
Present Value	\$9,563	\$8,002	\$6,696	\$5,603	\$29,865

### Office Costs

Additional Storage Costs =	\$1,000.00
After-tax expense =	\$600.00
Present value of costs =	\$1,404.92

NPV adjusted for side costs =  $-98,775 - \$29,865 - \$1405 = \$130,045$

### Opportunity costs aggregated into cash flows

Year	Cashflows	Opportunity costs	w with opportunit	Present Value
0	-\$1,150,000		-\$1,150,000	-\$1,150,000
1	\$340,000	\$12,600	\$327,400	\$260,916
2	\$415,000	\$13,200	\$401,800	\$255,184
3	\$446,500	\$13,830	\$432,670	\$218,989
4	\$720,730	\$14,492	\$706,238	\$284,865
Adjusted NPV				-\$130,045

## Case 3: Excess Capacity

- In the Aracruz example, assume that the firm will use its existing distribution system to service the production out of the new paper plant. The new plant manager argues that there is no cost associated with using this system, since it has been paid for already and cannot be sold or leased to a competitor (and thus has no competing current use). Do you agree?
  - a) Yes
  - b) No

## Case 4: Excess Capacity: A More Complicated Example

- Assume that a cereal company has a factory with a capacity to produce 100,000 boxes of cereal and that it expects to use only 50% of capacity to produce its existing product (Bran Banana) next year. This product's sales are expected to grow 10% a year in the long term and the company has an after-tax contribution margin (Sales price - Variable cost) of \$4 a unit.
- It is considering introducing a new cereal (Bran Raisin) and plans to use the excess capacity to produce the product. The sales in year 1 are expected to be 30,000 units and grow 5% a year in the long term; the after-tax contribution margin on this product is \$5 a unit.
- The book value of the factory is \$1 million. The cost of building a new factory with the same capacity is \$1.5 million. The company's cost of capital is 12%.

## A Framework for Assessing The Cost of Using Excess Capacity

- If I do not add the new product, when will I run out of capacity?
- If I add the new product, when will I run out of capacity?
- When I run out of capacity, what will I do?
  1. Cut back on production: cost is PV of after-tax cash flows from lost sales
  2. Buy new capacity: cost is difference in PV between earlier & later investment

## Opportunity Cost of Excess Capacity

Year	Old	New	Old + New	Lost ATCF	PV(ATCF)
1	50.00%	30.00%	80.00%	\$0	
2	55.00%	31.50%	86.50%	\$0	
3	60.50%	33.08%	93.58%	\$0	
4	66.55%	34.73%	101.28%	\$5,115	\$ 3,251
5	73.21%	36.47%	109.67%	\$38,681	\$ 21,949
6	80.53%	38.29%	118.81%	\$75,256	\$ 38,127
7	88.58%	40.20%	128.78%	\$115,124	\$ 52,076
8	97.44%	42.21%	139.65%	\$158,595	\$ 64,054
9	100%	44.32%	144.32%	\$177,280	\$ 63,929
10	100%	46.54%	146.54%	\$186,160	\$ 59,939
				PV(Lost Sales)=	<b>\$ 303,324</b>

■ PV (Building Capacity In Year 3 Instead Of Year 8) =  $1,500,000/1.12^3$   
 $-1,500,000/1.12^8 = \$ 461,846$

■ Opportunity Cost of Excess Capacity = \$ 303,324

## Product and Project Cannibalization: A Real Cost?

Assume that in the Disney theme park example, 20% of the revenues at the Rio Disney park are expected to come from people who would have gone to Disney theme parks in the US. In doing the analysis of the park, you would

- a) Look at only incremental revenues (i.e. 80% of the total revenue)
- b) Look at total revenues at the park
- c) Choose an intermediate number

Would your answer be different if you were analyzing whether to introduce a new show on the Disney cable channel on Saturday mornings that is expected to attract 20% of its viewers from ABC (which is also owned by Disney)?

- a) Yes
- b) No



## B. Project Synergies

- A project may provide benefits for other projects within the firm. Consider, for instance, a typical Disney animated movie. Assume that it costs \$ 50 million to produce and promote. This movie, in addition to theatrical revenues, also produces revenues from
  - the sale of merchandise (stuffed toys, plastic figures, clothes ..)
  - increased attendance at the theme parks
  - stage shows (see “Beauty and the Beast” and the “Lion King”)
  - television series based upon the movie
- In investment analysis, however, these synergies are either left unquantified and used to justify overriding the results of investment analysis, i.e., used as justification for investing in negative NPV projects.
- If synergies exist and they often do, these benefits have to be valued and shown in the initial project analysis.

### Example 1: Adding a Café to a bookstore: Bookscape

- Assume that you are considering adding a café to the bookstore. Assume also that based upon the expected revenues and expenses, the café standing alone is expected to have a net present value of -\$91,097.
- The cafe will increase revenues at the book store by \$500,000 in year 1, growing at 10% a year for the following 4 years. In addition, assume that the pre-tax operating margin on these sales is 10%.

Side Benefits	1	2	3	4	5
Increased Revenues	\$500,000	\$550,000	\$605,000	\$665,500	\$732,050
Operating Margin	10.00%	10.00%	10.00%	10.00%	10.00%
Operating Income	\$50,000	\$55,000	\$60,500	\$66,550	\$73,205
Operating Income after Taxes	\$29,000	\$31,900	\$35,090	\$38,599	\$42,459
PV of Additional Cash Flows	\$25,239	\$24,163	\$23,132	\$22,146	\$21,201
PV of Synergy Benefits	\$115,882				
Net Present Value (without synergies) =	-\$91,097				
Net Present Value (with synergies) =	\$24,785				

- The net present value of the added benefits is \$115,882. Added to the NPV of the standalone Café of -\$91,097 yields a net present value of \$24,785.

## Case 2: Synergy in a merger..

- Earlier, we valued Sensient Technologies for an acquisition by Tata Chemicals and estimated a value of \$ 1,559 million for the operating assets and \$ 1,107 million for the equity in the firm. In estimating this value, though, we treated Sensient Technologies as a stand-alone firm.
- Assume that Tata Chemicals foresees potential synergies in the combination of the two firms, primarily from using its distribution and marketing facilities in India to market Sensient's food additive products to India's rapidly growing processed food industry.
  - It will take Tata Chemicals approximately 3 years to adapt Sensient's products to match the needs of the Indian processed food sector – more spice, less color.
  - Tata Chemicals will be able to generate Rs 1,500 million in after-tax operating income in year 4 from Sensient's Indian sales, growing at a rate of 4% a year after that in perpetuity from Sensient's products in India.

## Estimating the cost of capital to use in valuing synergy..

- To estimate the cost of equity:
  - All of the perceived synergies flow from Sensient's products. We will use the levered beta of 0.8138 of Sensient in estimating cost of equity.
  - The synergies are expected to come from India; consequently, we will add the country risk premium of 4.51% for India.
- We will assume that Sensient will maintain its existing debt to capital ratio of 28.57%, its current dollar cost of debt of 5.5% and its marginal tax rate of 37%.

- Cost of debt in US \$ = 5.5% (1-.37) = 3.47%
- Cost of capital in US \$ = 12.05% (1-.2857) + 3.47% (.2857) = 9.60%

- Cost of capital in Rs =  $(1 + \text{Cost of Capital}_{\text{US \$}}) \frac{(1 + \text{Inflation Rate}_{\text{Rs}})}{(1 + \text{Inflation Rate}_{\text{US \$}})} - 1$
- $$= (1.096) \frac{(1.03)}{(1.02)} - 1 = 10.67\%$$

## Estimating the value of synergy... and what Tata can pay for Sensient...

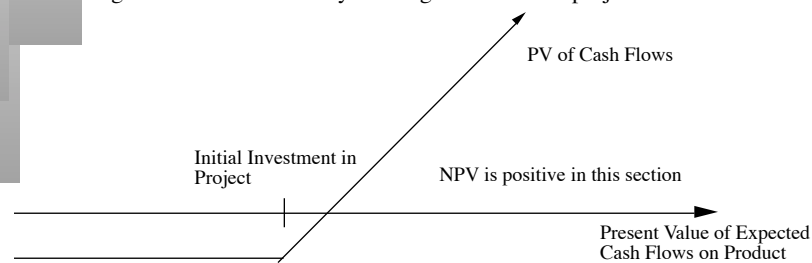
- We can now discount the expected cash flows back at the cost of capital to derive the value of synergy:
  - Value of synergy<sub>Year 3</sub> =  $\frac{\text{Expected Cash Flow}_{\text{Year 4}}}{(\text{Cost of Capital} - g)} = \frac{1500}{(.1067 - .04)} = \text{Rs } 22,476 \text{ million}$
  - Value of synergy today =  $\frac{\text{Value of Synergy}_{\text{Year 3}}}{(1 + \text{Cost of Capital})^3} = \frac{22,476}{(1.1067)^3} = \text{Rs } 16,580 \text{ million}$
- Earlier, we estimated the value of equity in Sensient Technologies, with no synergy, to be \$1,107 million. Converting the synergy value into dollar terms at the current exchange rate of Rs 47.50/\$, the total value that Tata Chemicals can pay for Sensient's equity:
  - Value of synergy in US \$ = Rs 16,580/47.50 = \$ 349 million
  - Value of Sensient Technologies = \$1,107 million + \$349 million = \$1,456 million

## III. Project 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.
- These options all add value to projects and may make a "bad" project (from traditional analysis) into a good one.

## 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. The rights to a “bad” project can still have value.

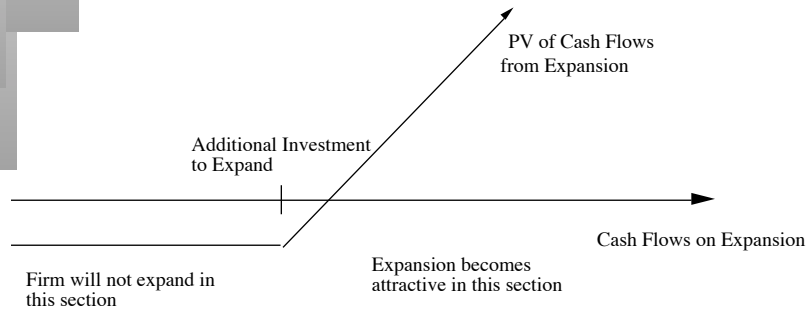


## Insights for Investment Analyses

- 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.

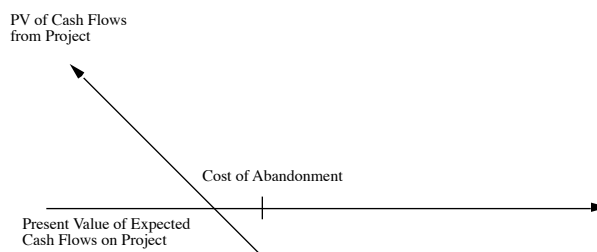
## The Option to Expand/Take Other Projects

- 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.



## The Option to Abandon

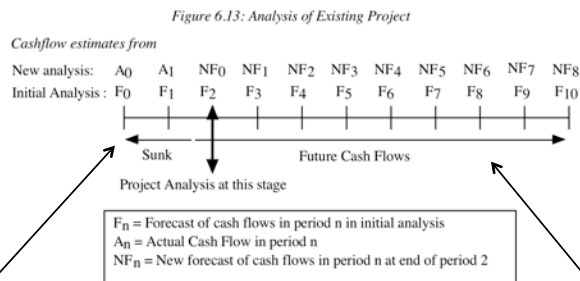
- A firm may sometimes have the option to abandon a project, if the cash flows do not measure up to expectations.
- If abandoning the project allows the firm to save itself from further losses, this option can make a project more valuable.



## IV. Assessing Existing or Past investments...

- While much of our discussion has been focused on analyzing new investments, the techniques and principles enunciated apply just as strongly to existing investments.
- With existing investments, we can try to address one of two questions:
  - Post-mortem: We can look back at existing investments and see if they have created value for the firm.
  - What next? We can also use the tools of investment analysis to see whether we should keep, expand or abandon existing investments.

## Analyzing an Existing Investment



In a post-mortem, you look at the actual cash flows, relative to forecasts.

You can also reassess your expected cash flows, based upon what you have learned, and decide whether you should expand, continue or divest (abandon) an investment

## a. Post Mortem Analysis

- The actual cash flows from an investment can be greater than or less than originally forecast for a number of reasons but all these reasons can be categorized into two groups:
  - **Chance:** The nature of risk is that actual outcomes can be different from expectations. Even when forecasts are based upon the best of information, they will invariably be wrong in hindsight because of unexpected shifts in both macro (inflation, interest rates, economic growth) and micro (competitors, company) variables.
  - **Bias:** If the original forecasts were biased, the actual numbers will be different from expectations. The evidence on capital budgeting is that managers tend to be over-optimistic about cash flows and the bias is worse with over-confident managers.
- While it is impossible to tell on an individual project whether chance or bias is to blame, there is a way to tell across projects and across time. If chance is the culprit, there should be symmetry in the errors – actuals should be about as likely to beat forecasts as they are to come under forecasts. If bias is the reason, the errors will tend to be in one direction.

## b. What should we do next?

$\sum_{t=0}^{t=n} \frac{NF_t}{(1+r)^t} < 0$	.....	Liquidate the project
$\sum_{t=0}^{t=n} \frac{NF_t}{(1+r)^t} < \text{Salvage Value}$	.....	Terminate the project
$\sum_{t=0}^{t=n} \frac{NF_t}{(1+r)^t} < \text{Divestiture Value}$	.....	Divest the project
$\sum_{t=0}^{t=n} \frac{NF_t}{(1+r)^t} > 0 > \text{Divestiture Value}$	.....	Continue the project

## Example: Disney California Adventure

- Disney opened the Disney California Adventure (DCA) Park in 2001, at a cost of \$1.5 billion, with a mix of roller coaster rides and movie nostalgia. Disney expected about 60% of its visitors to Disneyland to come across to DCA and generate about \$ 100 million in annual after-cash flows for the firm.
- By 2008, DCA had not performed up to expectations. Of the 15 million people who came to Disneyland in 2007, only 6 million visited California Adventure, and the cash flow averaged out to only \$ 50 million between 2001 and 2007.

In early 2008, Disney faced three choices:

- Shut down California Adventure and try to recover whatever it can of its initial investment. It is estimated that the firm recover about \$ 500 million of its investment.
- Continue with the status quo, recognizing that future cash flows will be closer to the actual values (\$ 50 million) than the original projections.
- Invest about \$ 600 million to expand and modify the park, with the intent of increasing the number of attractions for families with children, is expected to increase the percentage of Disneyland visitors who come to DCA from 40% to 60% and increase the annual after tax cash flow by 60% (from \$ 50 million to \$ 80 million) at the park.

## DCA: Evaluating the alternatives...

- **Continuing Operation:** Assuming the current after-tax cash flow of \$ 50 million will continue in perpetuity, growing at the inflation rate of 2% and discounting back at the theme park cost of capital of 6.62% yields a value for continuing with the status quo

$$\text{Value of DCA} = \frac{\text{Expected Cash Flow next year}}{(\text{Cost of capital} - g)} = \frac{50(1.02)}{(.0662 - .02)} = \$1.103 \text{ billion}$$

- **Abandonment:** Abandoning this investment currently would allow Disney to recover only \$ 500 million of its original investment.

$$\text{Abandonment value of DCA} = \$ 500 \text{ million}$$

- **Expansion:** The up-front cost of \$ 600 million will lead to more visitors in the park and an increase in the existing cash flows from \$ 50 to \$ 80 million.

$$\text{Value of CF from expansion} = \frac{\text{Increase in CF next year}}{(\text{Cost of capital} - g)} = \frac{30(1.02)}{(.0662 - .02)} = \$662 \text{ million}$$



# First Principles

## Chapters 5 & 6: Measuring Returns on Investments

