The Value of Flexibility
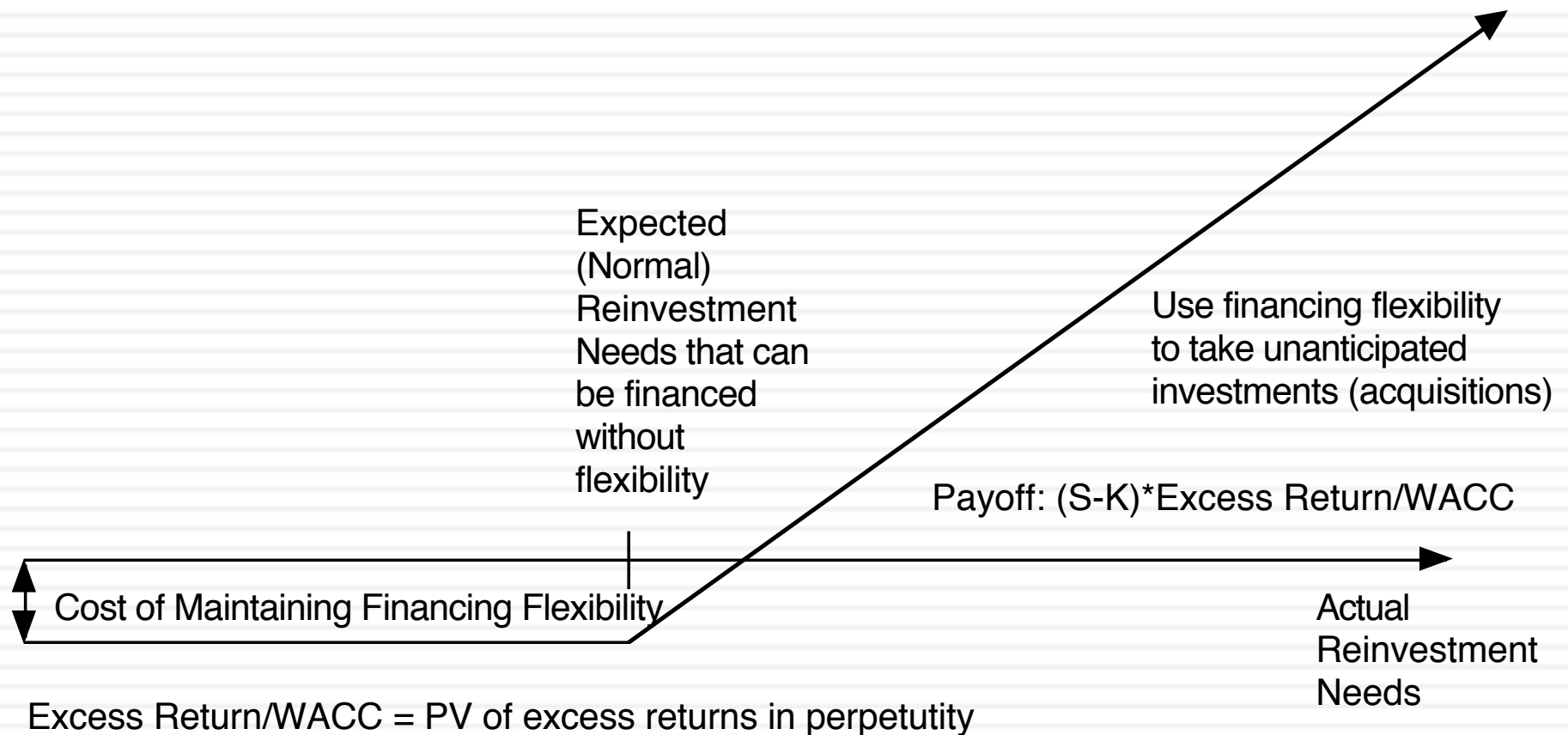
- Firms maintain excess debt capacity or larger cash balances than are warranted by current needs, to meet unexpected future requirements.

- While maintaining this financing flexibility has value to firms, it also has a cost; the excess debt capacity implies that the firm is giving up some value and has a higher cost of capital.

- The value of flexibility can be analyzed using the option pricing framework; a firm maintains large cash balances and excess debt capacity in order to have the option to take projects that might arise in the future.

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The Value of Flexibility

Expected (Normal) Reinvestment Needs that can be financed without flexibility

Use financing flexibility to take unanticipated investments (acquisitions)

Payoff: (S-K)*Excess Return/WACC

Cost of Maintaining Financing Flexibility

Actual Reinvestment Needs

Excess Return/WACC = PV of excess returns in perpetutity

Disney's Optimal Debt Ratio

Debt Ratio	Cost of Equity	Cost of Debt	Cost of Capital
0.00%	13.00%	4.61%	13.00%
10.00%	13.43%	4.61%	12.55%
Current:18%	13.85%	4.80%	12.22%
20.00%	13.96%	4.99%	12.17%
30.00%	14.65%	5.28%	11.84%
40.00%	15.56%	5.76%	11.64%
50.00%	16.85%	6.56%	11.70%
60.00%	18.77%	7.68%	12.11%
70.00%	21.97%	7.68%	11.97%
80.00%	28.95%	7.97%	12.17%
90.00%	52.14%	9.42%	13.69%

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Inputs to Option Valuation Model- Disney

Model input	Estimated as	In general…	For Disney
S	Expected annual reinvestment needs (as % of firm value)	Measures magnitude of reinvestment needs	Average of Reinvestment/ Value over last 5 years = 5.3%
σ^2	Variance in annual reinvestment needs	Measures how much volatility there is in investment needs.	Variance over last 5 years in ln(Reinvestment/Value) =0.375
K	(Internal + Normal access to external funds)/ Value	Measures the capital constraint	Average over last 5 years = 4.8%
T	1 year	Measures an annual value for flexibility	T =1

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Valuing Flexibility at Disney

□ The value of an option with these characteristics is 1.6092%. You can consider this the value of the option to take a project, but the overall value of flexibility will still depend upon the quality of the projects taken. In other words, the value of the option to take a project is zero if the project has zero net present value.

□ Disney earns 18.69% on its projects has a cost of capital of 12.22%. The excess return (annually) is 6.47%. Assuming that they can continue to generate these excess returns in perpetuity:

Value of Flexibility (annual)= 1.6092%(.0647/.1222) = 0.85 % of value

□ Disney's cost of capital at its optimal debt ratio is 11.64%. The cost it incurs to maintain flexibility is therefore 0.58% annually (12.22%-11.64%). It therefore pays to maintain flexibility.

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Determinants of the Value of Flexibility

- ☐ Capital Constraints (External and Internal): The greater the capacity to raise funds, either internally or externally, the less the value of flexibility.
  - ◘ 1.1: Firms with significant internal operating cash flows should value flexibility less than firms with small or negative operating cash flows.
  - ◘ 1.2: Firms with easy access to financial markets should have a lower value for flexibility than firms without that access.
- ☐ Unpredictability of reinvestment needs: The more unpredictable the reinvestment needs of a firm, the greater the value of flexibility.
- ☐ Capacity to earn excess returns: The greater the capacity to earn excess returns, the greater the value of flexibility.
  - ◘ 1.3: Firms that do not have the capacity to earn or sustain excess returns get no value from flexibility.

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E. Valuing Equity as an option

- □ The equity in a firm is a residual claim, i.e., equity holders lay claim to all cashflows left over after other financial claim-holders (debt, preferred stock etc.) have been satisfied.

- □ If a firm is liquidated, the same principle applies, with equity investors receiving whatever is left over in the firm after all outstanding debts and other financial claims are paid off.

- □ The principle of limited liability, however, protects equity investors in publicly traded firms if the value of the firm is less than the value of the outstanding debt, and they cannot lose more than their investment in the firm.

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Payoff Diagram for Liquidation Option

Net Payoff
on Equity

Face Value
of Debt
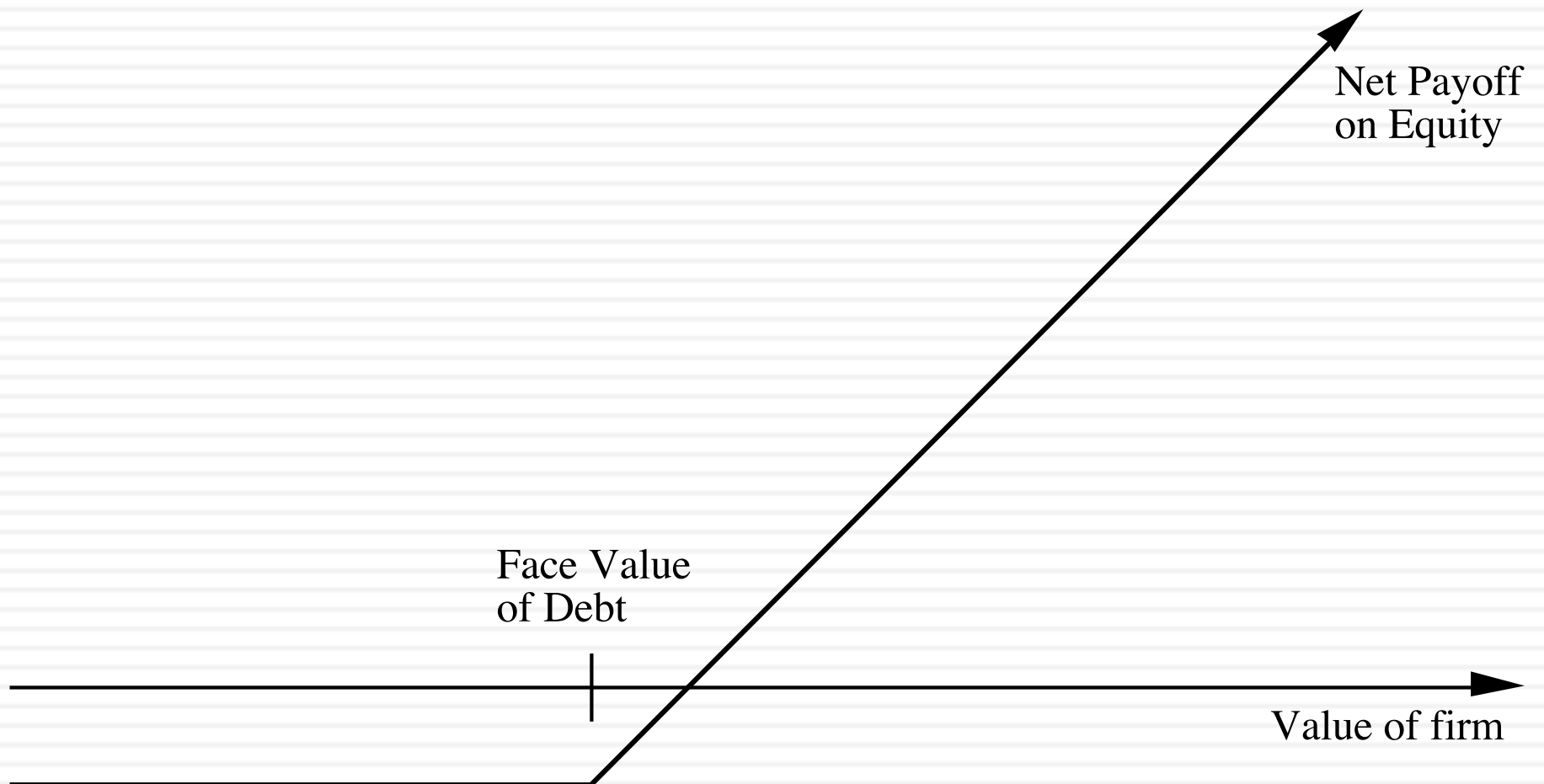
Value of firm

Application to valuation: A simple example

- ☐ Assume that you have a firm whose assets are currently valued at $100 million and that the standard deviation in this asset value is 40%.

- ☐ Further, assume that the face value of debt is $80 million (It is zero coupon debt with 10 years left to maturity).

- ☐ If the ten-year treasury bond rate is 10%,

  - ◘ how much is the equity worth?
  - ◘ What should the interest rate on debt be?

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Model Parameters

- Value of the underlying asset = S
  - Value of the firm = $ 100 million
- Exercise price = K
  - Face Value of outstanding debt = $ 80 million
- Life of the option = t
  - Life of zero-coupon debt = 10 years
- Variance in the value of the underlying asset = σ^2
  - Variance in firm value = 0.16
- Riskless rate = r
  - Treasury bond rate corresponding to option life = 10%

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Valuing Equity as a Call Option

- Based upon these inputs, the Black-Scholes model provides the following value for the call:

  d1 = 1.5994   N(d1) = 0.9451

  d2 = 0.3345   N(d2) = 0.6310

- Value of the call = 100 (0.9451) - 80 exp$^{(-0.10)(10)}$ (0.6310) = \$75.94 million

- Value of the outstanding debt = \$100 - \$75.94 = \$24.06 million

- Interest rate on debt = (\$ 80 / \$24.06)$^{1/10}$ -1 = 12.77%

I. The Effect of Catastrophic Drops in Value

□ Assume now that a catastrophe wipes out half the value of this firm (the value drops to $ 50 million), while the face value of the debt remains at $ 80 million. What will happen to the equity value of this firm?

a. It will drop in value to $ 25.94 million [$ 50 million - market value of debt from previous page]

b. It will be worth nothing since debt outstanding > Firm Value

c. It will be worth more than $ 25.94 million

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Valuing Equity in the Troubled Firm

- Value of the underlying asset = S
  - Value of the firm = $ 50 million
- Exercise price = K
  - Face Value of outstanding debt = $ 80 million
- Life of the option = t
  - Life of zero-coupon debt = 10 years
- Variance in the value of the underlying asset = σ^2
  - Variance in firm value = 0.16
- Riskless rate = r
  - Treasury bond rate corresponding to option life = 10%

The Value of Equity as an Option

- Based upon these inputs, the Black-Scholes model provides the following value for the call:

  d1 = 1.0515   N(d1) = 0.8534

  d2 = -0.2135   N(d2) = 0.4155

- Value of the call = 50 (0.8534) - 80 exp$^{(-0.10)(10)}$ (0.4155) = $30.44 million

- Value of the bond= $50 - $30.44 = $19.56 million

- The equity in this firm drops by $45.50 million, less than the overall drop in value of $50 million, because of the option characteristics of equity.

- This might explain why stock in firms, which are in Chapter 11 and essentially bankrupt, still has value.

Equity value persists ..

Value of Equity as Firm Value Changes

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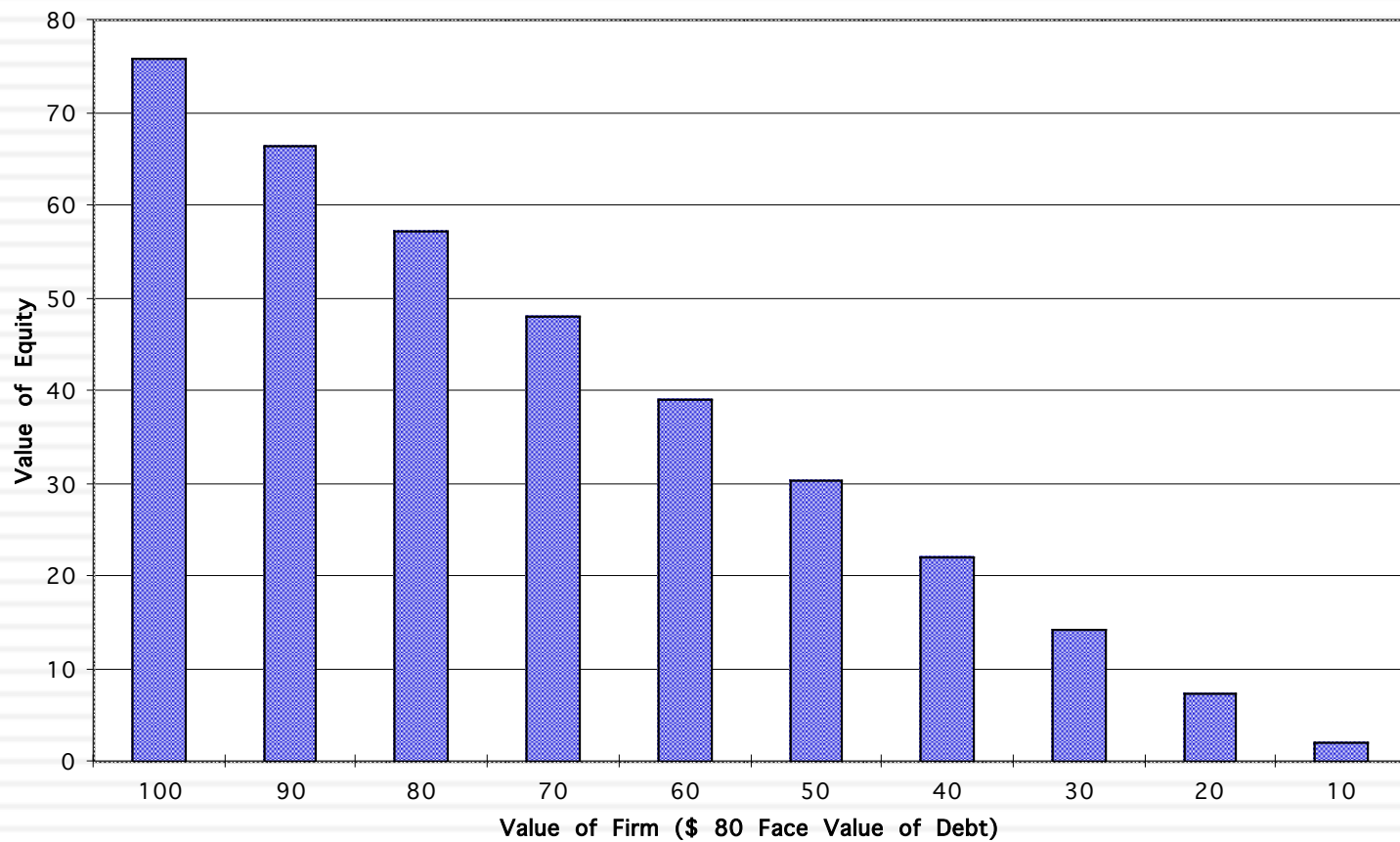
II. The conflict between stockholders and bondholders

- ☐ Consider again the firm described in the earlier example , with a value of assets of $100 million, a face value of zero-coupon ten-year debt of $80 million, a standard deviation in the value of the firm of 40%. The equity and debt in this firm were valued as follows:
  - ◻ Value of Equity = $75.94 million
  - ◻ Value of Debt = $24.06 million
  - ◻ Value of Firm == $100 million

- ☐ Now assume that the stockholders have the opportunity to take a project with a negative net present value of -$2 million, but assume that this project is a very risky project that will push up the standard deviation in firm value to 50%. Would you invest in this project?
  - a. Yes
  - b. No

Valuing Equity after the Project

- Value of the underlying asset = S
  - Value of the firm = $ 100 million - $2 million = $ 98 million (The value of the firm is lowered because of the negative net present value project)
- Exercise price = K
  - Face Value of outstanding debt = $ 80 million
- Life of the option = t
- Life of zero-coupon debt = 10 years
- Variance in the value of the underlying asset = σ^2
  - Variance in firm value = 0.25
- Riskless rate = r
  - Treasury bond rate corresponding to option life = 10%

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Option Valuation

- Option Pricing Results for Equity and Debt Value
  - Value of Equity = $77.71
  - Value of Debt = $20.29
  - Value of Firm = $98.00

- The value of equity rises from $75.94 million to $ 77.71 million , even though the firm value declines by $2 million. The increase in equity value comes at the expense of bondholders, who find their wealth decline from $24.06 million to $20.19 million.

Effects of an Acquisition

□ Assume that you are the manager of a firm and that you buy another firm, with a fair market value of $ 150 million, for exactly $ 150 million. In an efficient market, the stock price of your firm will

a. Increase

b. Decrease

c. Remain Unchanged

Effects on equity of a conglomerate merger

□ You are provided information on two firms, which operate in unrelated businesses and hope to merge.

	Firm A	Firm B
Value of the firm	$100 million	$ 150 million
Face Value of Debt (10 yr zeros)	$ 80 million	$ 50 million
Maturity of debt	10 years	10 years
Std. Dev. in value	40 %	50 %
Correlation between cashflows	0.4	

▫ The ten-year bond rate is 10%.

□ The variance in the value of the firm after the acquisition can be calculated as follows:

Variance in combined firm value $= w_1^2\, \sigma_1^2 + w_2^2\, \sigma_2^2 + 2\, w_1\, w_2\, \rho_{12}\sigma_1\sigma_2$

$= (0.4)^2\,(0.16) + (0.6)^2\,(0.25) + 2\,(0.4)\,(0.6)\,(0.4)\,(0.4)\,(0.5)$

$= 0.154$

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Valuing the Combined Firm

□ The values of equity and debt in the individual firms and the combined firm can then be estimated using the option pricing model:

	Firm A	Firm B	Combined firm
Value of equity in the firm	$75.94	$134.47	$ 207.43
Value of debt in the firm	$24.06	$ 15.53	$ 42.57
Value of the firm	$100.00	$150.00	$ 250.00

□ The combined value of the equity prior to the merger is $ 210.41 million and it declines to $207.43 million after.

□ The wealth of the bondholders increases by an equal amount.

□ There is a transfer of wealth from stockholders to bondholders, as a consequence of the merger. Thus, conglomerate mergers that are not followed by increases in leverage are likely to see this redistribution of wealth occur across claim holders in the firm.

Obtaining option pricing inputs - Some real world problems

□ The examples that have been used to illustrate the use of option pricing theory to value equity have made some simplifying assumptions. Among them are the following:

(1) There were only two claim holders in the firm - debt and equity.

(2) There is only one issue of debt outstanding and it can be retired at face value.

(3) The debt has a zero coupon and no special features (convertibility, put clauses etc.)

(4) The value of the firm and the variance in that value can be estimated.

Real World Approaches to Valuing Equity in Troubled Firms: Getting Inputs

Input	Estimation Process
Value of the Firm	• Cumulate market values of equity and debt (or) • Value the <u>assets in place</u> using FCFF and WACC (or) • Use cumulated market value of assets, if traded.
Variance in Firm Value	• If stocks and bonds are traded, $\sigma^2_{firm} = w_e^2\ \sigma_e^2 + w_d^2\ \sigma_d^2 + 2\ w_e\ w_d\ \rho_{ed}\ \sigma_e\ \sigma_d$ where σ_e^2 = variance in the stock price w_e = MV weight of Equity σ_d^2 = the variance in the bond price $\quad w_d$ = MV weight of debt • If not traded, use variances of similarly rated bonds. • Use average firm value variance from the industry in which company operates.
Value of the Debt	• If the debt is short term, you can use only the face or book value of the debt. • If the debt is long term and coupon bearing, add the cumulated nominal value of these coupons to the face value of the debt.
Maturity of the Debt	• Face value weighted duration of bonds outstanding (or) • If not available, use weighted maturity

Valuing Equity as an option - Eurotunnel in early 1998

- ☐ Eurotunnel has been a financial disaster since its opening
  - ❑ In 1997, Eurotunnel had earnings before interest and taxes of -£56 million and net income of -£685 million
  - ❑ At the end of 1997, its book value of equity was -£117 million
- ☐ It had £8,865 million in face value of debt outstanding
  - ❑ The weighted average duration of this debt was 10.93 years

Debt Type	Face Value	Duration
Short term	935	0.50
10 year	2435	6.7
20 year	3555	12.6
Longer	1940	18.2
Total	£8,865 mil	10.93 years

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The Basic DCF Valuation

- The value of the firm estimated using projected cashflows to the firm, discounted at the weighted average cost of capital was £2,312 million.

- This was based upon the following assumptions –

  - Revenues will grow 5% a year in perpetuity.

  - The COGS which is currently 85% of revenues will drop to 65% of revenues in yr 5 and stay at that level.

  - Capital spending and depreciation will grow 5% a year in perpetuity.

  - There are no working capital requirements.

  - The debt ratio, which is currently 95.35%, will drop to 70% after year 5. The cost of debt is 10% in high growth period and 8% after that.

  - The beta for the stock will be 1.10 for the next five years, and drop to 0.8 after the next 5 years.

  - The long term bond rate is 6%.

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Other Inputs

- The stock has been traded on the London Exchange, and the annualized std deviation based upon ln (prices) is 41%.

- There are Eurotunnel bonds, that have been traded; the annualized std deviation in ln(price) for the bonds is 17%.
  - The correlation between stock price and bond price changes has been 0.5. The proportion of debt in the capital structure during the period (1992-1996) was 85%.
  - Annualized variance in firm value

  $= (0.15)^2 (0.41)^2 + (0.85)^2 (0.17)^2 + 2 (0.15) (0.85)(0.5)(0.41)(0.17) = 0.0335$

- The 15-year bond rate is 6%. (I used a bond with a duration of roughly 11 years to match the life of my option)

Valuing Eurotunnel Equity and Debt

- Inputs to Model
  - Value of the underlying asset = S = Value of the firm = £2,312 million
  - Exercise price = K = Face Value of outstanding debt = £8,865 million
  - Life of the option = t = Weighted average duration of debt = 10.93 years
  - Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.0335
  - Riskless rate = r = Treasury bond rate corresponding to option life = 6%
- Based upon these inputs, the Black-Scholes model provides the following value for the call:
  - d1 = -0.8337   N(d1) = 0.2023
  - d2 = -1.4392   N(d2) = 0.0751
- Value of the call = 2312 (0.2023) - 8,865 exp$^{(-0.06)(10.93)}$ (0.0751) = £122 million
- Appropriate interest rate on debt = (8865/2190)$^{(1/10.93)}$-1= 13.65%

In Closing…

□ There are real options everywhere.

□ Most of them have no significant economic value because there is no exclusivity associated with using them.

□ When options have significant economic value, the inputs needed to value them in a binomial model can be used in more traditional approaches (decision trees) to yield equivalent value.

□ The real value from real options lies in

- Recognizing that building in flexibility and escape hatches into large decisions has value

- Insights we get on understanding how and why companies behave the way they do in investment analysis and capital structure choices.
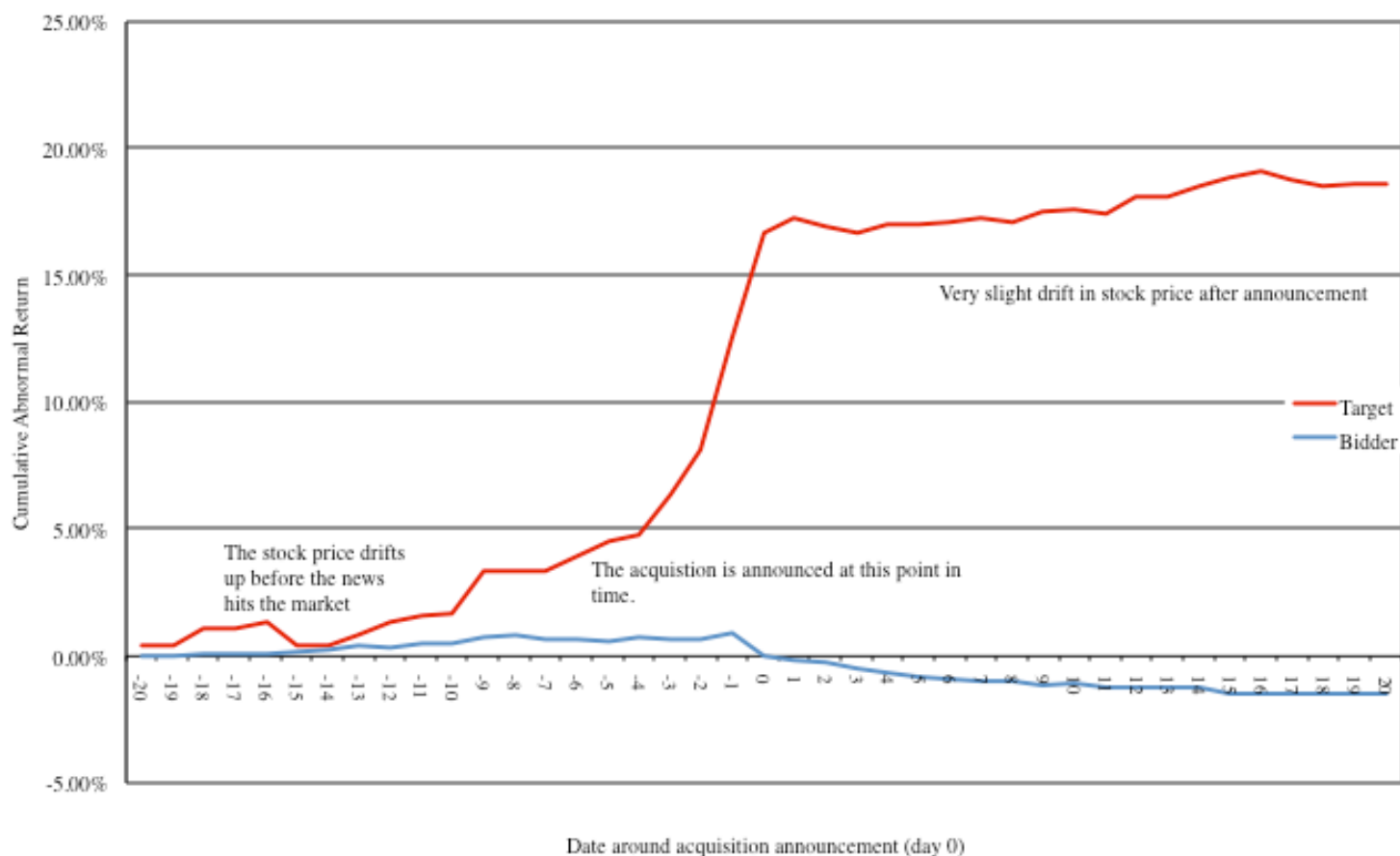
Acquirers Anonymous: Seven Steps back to Sobriety...

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Great for target companies but not for acquiring company stockholders...

Cumulative Returns: Target and Bidder firms in Public Acquisitions

Aswath Damodaran

And the long-term follow up is not positive either..

- Managers often argue that the market is unable to see the long term benefits of mergers that they can see at the time of the deal. If they are right, mergers should create long term benefits to acquiring firms.

- The evidence does not support this hypothesis:
  - McKinsey and Co. has examined acquisition programs at companies on
    - Did the return on capital invested in acquisitions exceed the cost of capital?
    - Did the acquisitions help the parent companies outperform the competition?
    - Half of all programs failed one test, and a quarter failed both.
  - Synergy is elusive. KPMG in a more recent study of global acquisitions concludes that most mergers (>80%) fail - the merged companies do worse than their peer group.
  - A large number of acquisitions that are reversed within fairly short time periods. About 20% of the acquisitions made between 1982 and 1986 were divested by 1988. In studies that have tracked acquisitions for longer time periods (ten years or more) the divestiture rate of acquisitions rises to almost 50%.

The disease is spreading: Indian firms acquiring US targets – 1999 - 2005

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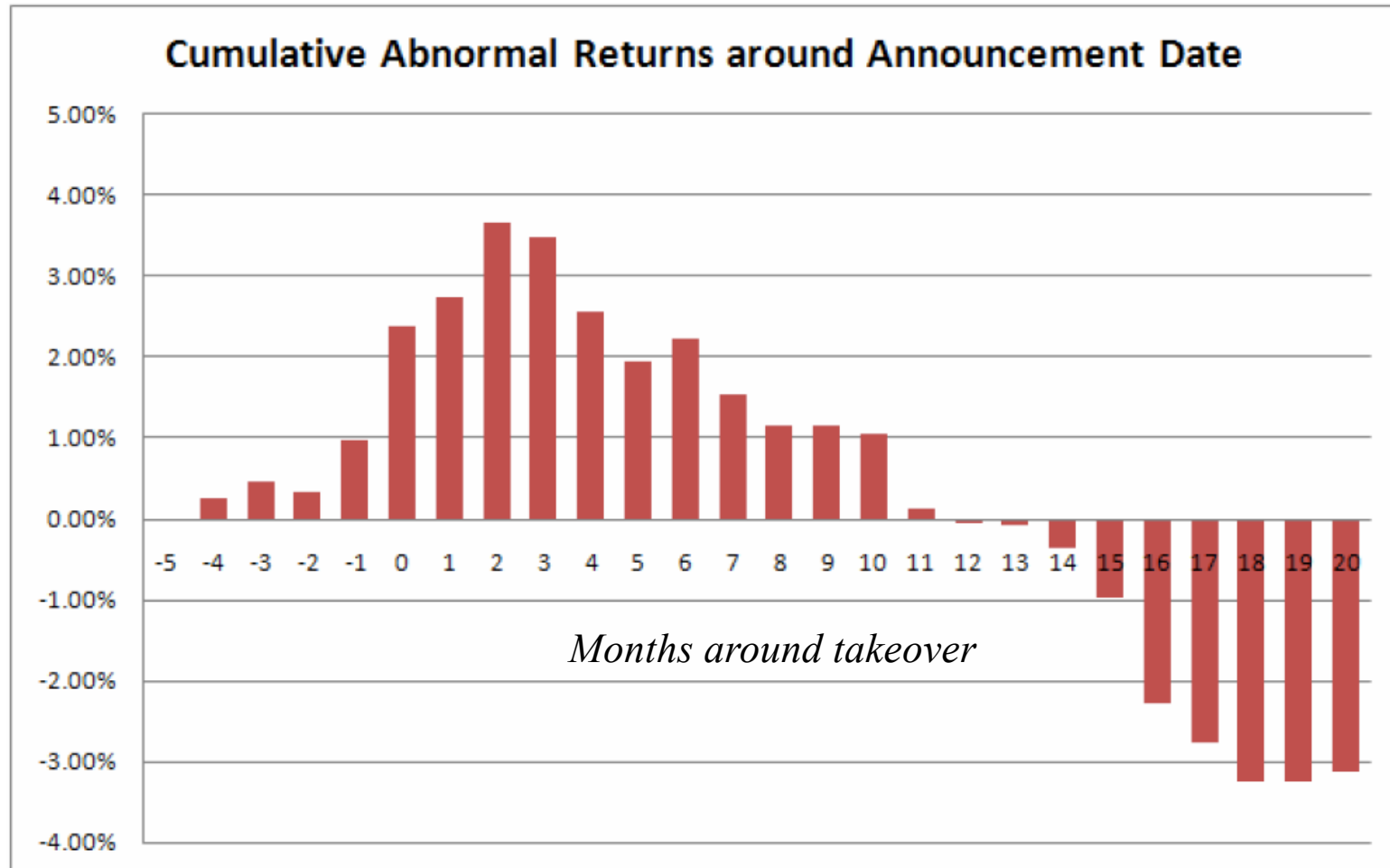
Growing through acquisitions seems to be a "loser's game"

- Firms that grow through acquisitions have generally had far more trouble creating value than firms that grow through internal investments.

- In general, acquiring firms tend to
    - Pay too much for target firms
    - Over estimate the value of "synergy" and "control"
    - Have a difficult time delivering the promised benefits

- Worse still, there seems to be very little learning built into the process. The same mistakes are made over and over again, often by the same firms with the same advisors.

- Conclusion: There is something structurally wrong with the process for acquisitions which is feeding into the mistakes.

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The seven sins in acquisitions…

1. Risk Transference: Attributing acquiring company risk characteristics to the target firm.

2. Debt subsidies: Subsiding target firm stockholders for the strengths of the acquiring firm.

3. Auto-pilot Control: The "20% control premium" and other myth…

4. Elusive Synergy: Misidentifying and mis-valuing synergy.

5. Its all relative: Transaction multiples, exit multiples…

6. Verdict first, trial afterwards: Price first, valuation to follow

7. It's not my fault: Holding no one responsible for delivering results.

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Testing sheet

Test	Passed/Failed	Rationalization
Risk transference		
Debt subsidies		
Control premium		
The value of synergy		
Comparables and Exit Multiples		
Bias		
A successful acquisition strategy		

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Lets start with a target firm

□ The target firm has the following income statement:

Revenues	100
Operating Expenses	80
= Operating Income	20
Taxes	8
= After-tax OI	12

□ Assume that this firm will generate this operating income forever (with no growth) and that the cost of equity for this firm is 20%. The firm has no debt outstanding. What is the value of this firm?

Test 1: Risk Transference…

□ Assume that as an acquiring firm, you are in a much safer business and have a cost of equity of 10%. What is the value of the target firm to you?

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Lesson 1: Don't transfer your risk characteristics to the target firm

- □ The cost of equity used for an investment should reflect the risk of the investment and not the risk characteristics of the investor who raised the funds.

- □ Risky businesses cannot become safe just because the buyer of these businesses is in a safe business.

Test 2: Cheap debt?

- Assume as an acquirer that you have access to cheap debt (at 4%) and that you plan to fund half the acquisition with debt. How much would you be willing to pay for the target firm?

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Lesson 2: Render unto the target firm that which is the target firm's but not a penny more..

- [ ] As an acquiring firm, it is entirely possible that you can borrow much more than the target firm can on its own and at a much lower rate. If you build these characteristics into the valuation of the target firm, you are essentially transferring wealth from your firm's stockholder to the target firm's stockholders.

- [ ] When valuing a target firm, use a cost of capital that reflects the debt capacity and the cost of debt that would apply to the firm.

Test 3: Control Premiums

□ Assume that you are now told that it is conventional to pay a 20% premium for control in acquisitions (backed up by Mergerstat). How much would you be willing to pay for the target firm?

□ Would your answer change if I told you that you can run the target firm better and that if you do, you will be able to generate a 30% pre-tax operating margin (rather than the 20% margin that is currently being earned).

□ What if the target firm were perfectly run?

Lesson 3: Beware of rules of thumb…

☐ Valuation is cluttered with rules of thumb. After painstakingly valuing a target firm, using your best estimates, you will be often be told that

- ❑ It is common practice to add arbitrary premiums for brand name, quality of management, control etc…

- ❑ These premiums will be often be backed up by data, studies and services. What they will not reveal is the enormous sampling bias in the studies and the standard errors in the estimates.

- ❑ If you have done your valuation right, those premiums should already be incorporated in your estimated value. Paying a premium will be double counting.

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Test 4: Synergy….

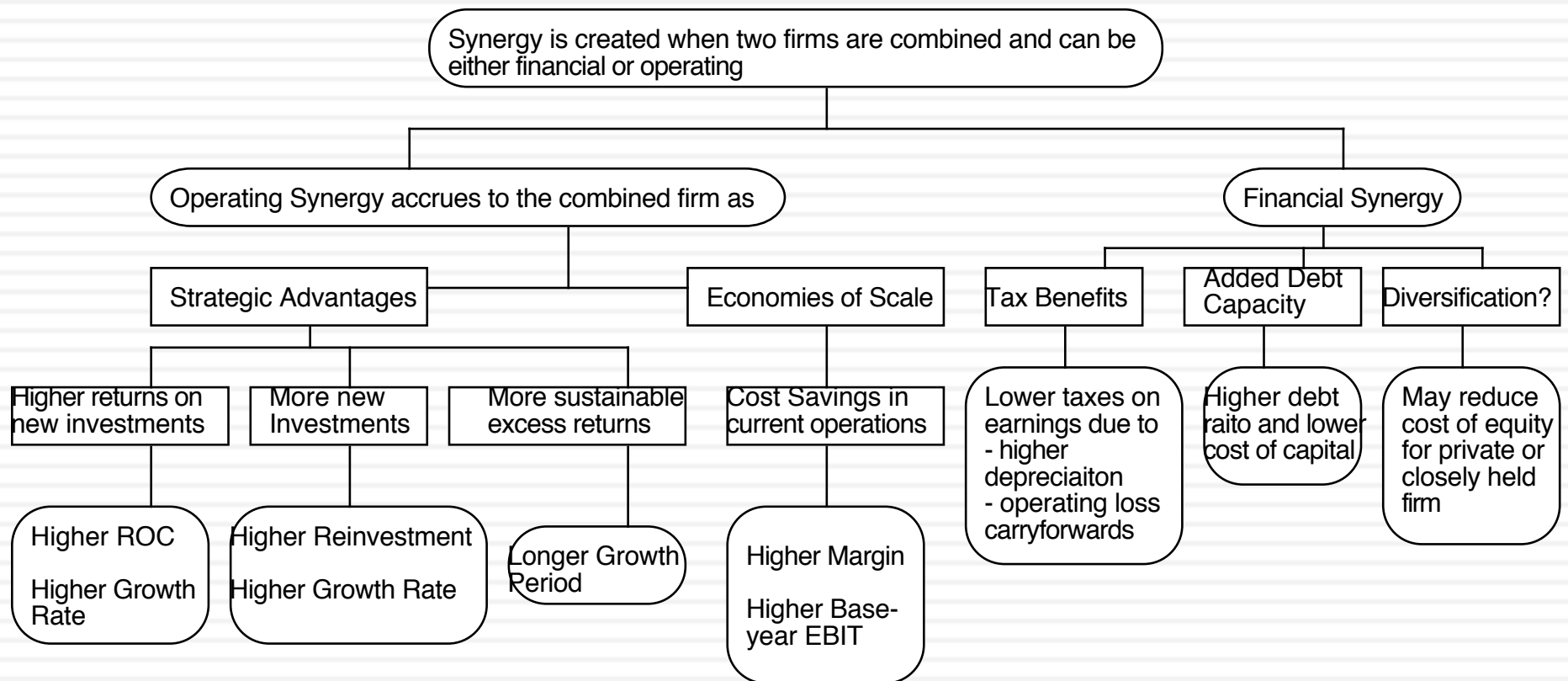- Assume that you are told that the combined firm will be less risky than the two individual firms and that it should have a lower cost of capital (and a higher value). Is this likely?

- Assume now that you are told that there are potential growth and cost savings synergies in the acquisition. Would that increase the value of the target firm?

- Should you pay this as a premium?

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The Value of Synergy

Synergy is created when two firms are combined and can be either financial or operating

Operating Synergy accrues to the combined firm as

Financial Synergy

Strategic Advantages

Economies of Scale

Tax Benefits

Added Debt Capacity

Diversification?

Higher returns on new investments

More new Investments

More sustainable excess returns

Cost Savings in current operations

Lower taxes on earnings due to
- higher depreciaiton
- operating loss carryforwards

Higher debt raito and lower cost of capital

May reduce cost of equity for private or closely held firm

Higher ROC

Higher Growth Rate

Higher Reinvestment

Higher Growth Rate

Longer Growth Period

Higher Margin

Higher Base-year EBIT

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Valuing Synergy

(1) the firms involved in the merger are valued independently, by discounting expected cash flows to each firm at the weighted average cost of capital for that firm.

(2) the value of the combined firm, with no synergy, is obtained by adding the values obtained for each firm in the first step.

(3) The effects of synergy are built into expected growth rates and cashflows, and the combined firm is re-valued with synergy.

Value of Synergy = Value of the combined firm, with synergy - Value of the combined firm, without synergy

Synergy - Example 1
Higher growth and cost savings

	P&G	Gillette	Piglet: No Synergy	Piglet: Synergy	
Free Cashflow to Equity	$5,864.74	$1,547.50	$7,412.24	$7,569.73	Annual operating expenses reduced by $250 million
Growth rate for first 5 years	12%	10%	11.58%	12.50%	Slighly higher growth rate
Growth rate after five years	4%	4%	4.00%	4.00%	
Beta	0.90	0.80	0.88	0.88	
Cost of Equity	7.90%	7.50%	7.81%	7.81%	Value of synergy
Value of Equity	$221,292	$59,878	$281,170	$298,355	**$17,185**

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Synergy: Example 2
Tax Benefits?

- Assume that you are Best Buy, the electronics retailer, and that you would like to enter the hardware component of the market. You have been approached by investment bankers for Zenith, which while still a recognized brand name, is on its last legs financially. The firm has net operating losses of $ 2 billion. If your tax rate is 36%, estimate the tax benefits from this acquisition.

- If Best Buy had only $500 million in taxable income, how would you compute the tax benefits?

- If the market value of Zenith is $800 million, would you pay this tax benefit as a premium on the market value?

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Lesson 4: Don't pay for buzz words

□ Through time, acquirers have always found ways of justifying paying for premiums over estimated value by using buzz words - synergy in the 1980s, strategic considerations in the 1990s and real options in this decade.

□ While all of these can have value, the onus should be on those pushing for the acquisitions to show that they do and not on those pushing against them to show that they do not.