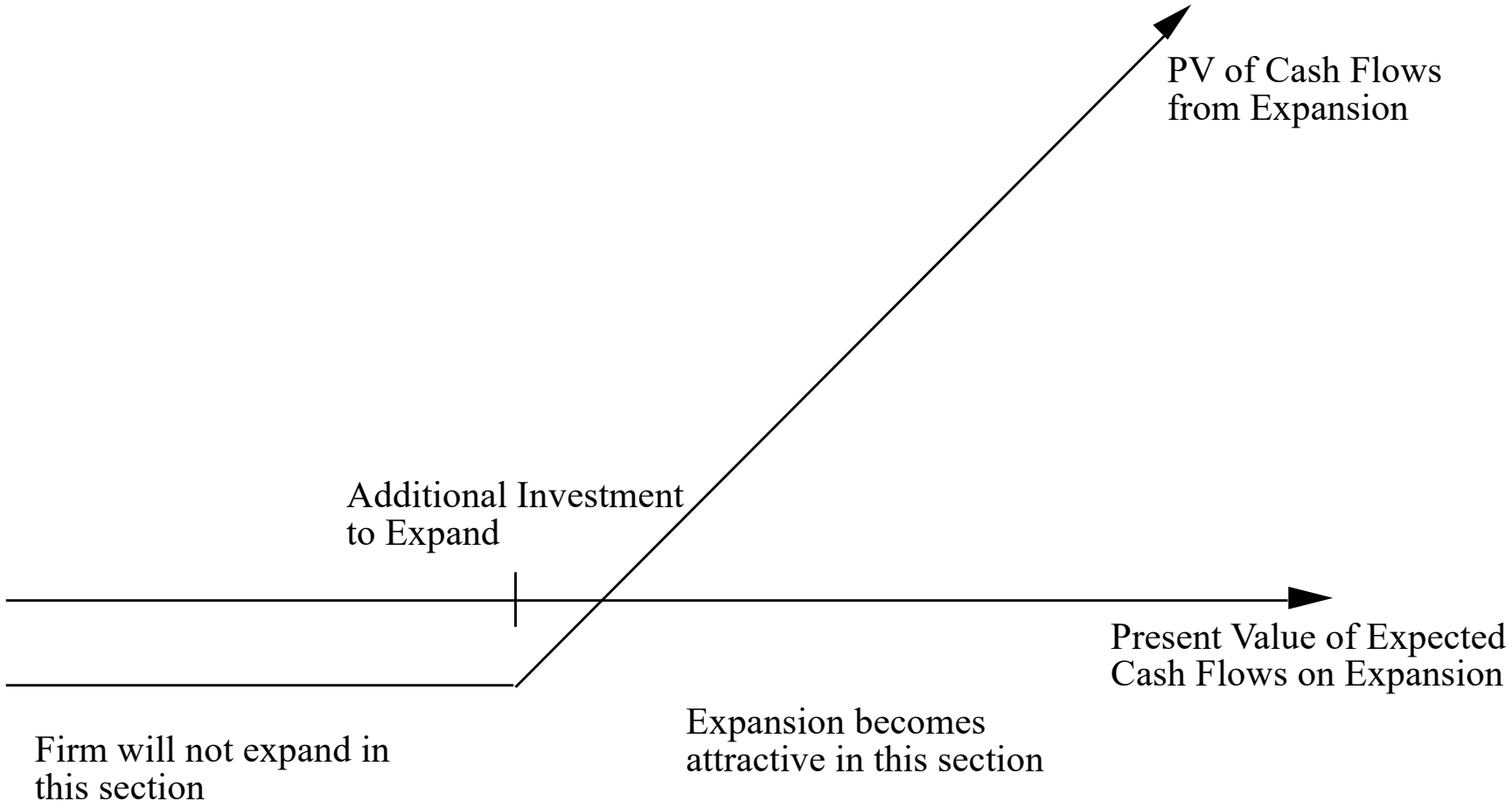
THE OPTION TO EXPAND



THE OPTION TO EXPAND: VALUING A YOUNG, START-UP COMPANY

- You have complete a DCF valuation of a small anti-virus software company, Secure Mail, and estimated a value of $115 million.
- Assume that there is the possibility that the company could use the customer base that it develops for the anti-virus software and the technology on which the software is based to create a database software program sometime in the next 5 years.
  - It will **cost Secure Mail about $500 million** to develop a new database program, if they decided to do it today.
  - Based upon the information you have now on the potential for a database program, the company can **expect to generate about $ 40 million a year in after-tax cashflows for ten years**. The cost of capital for private companies that provide database software **is 12%.**
  - The **annualized standard deviation** in firm value at publicly traded database companies is **50%.**
  - The **five-year treasury bond rate is 3%.**

VALUING THE EXPANSION OPTION

S = Value of entering the database software market

= PV of $40 million for 10 years @12% = $226 million

K = Exercise price

= Cost of entering the database software market = $ 500 million

t = Period over which you have the right to enter the market

= 5 years

s = Standard deviation of stock prices of database firms = 50%

r = Riskless rate = 3%

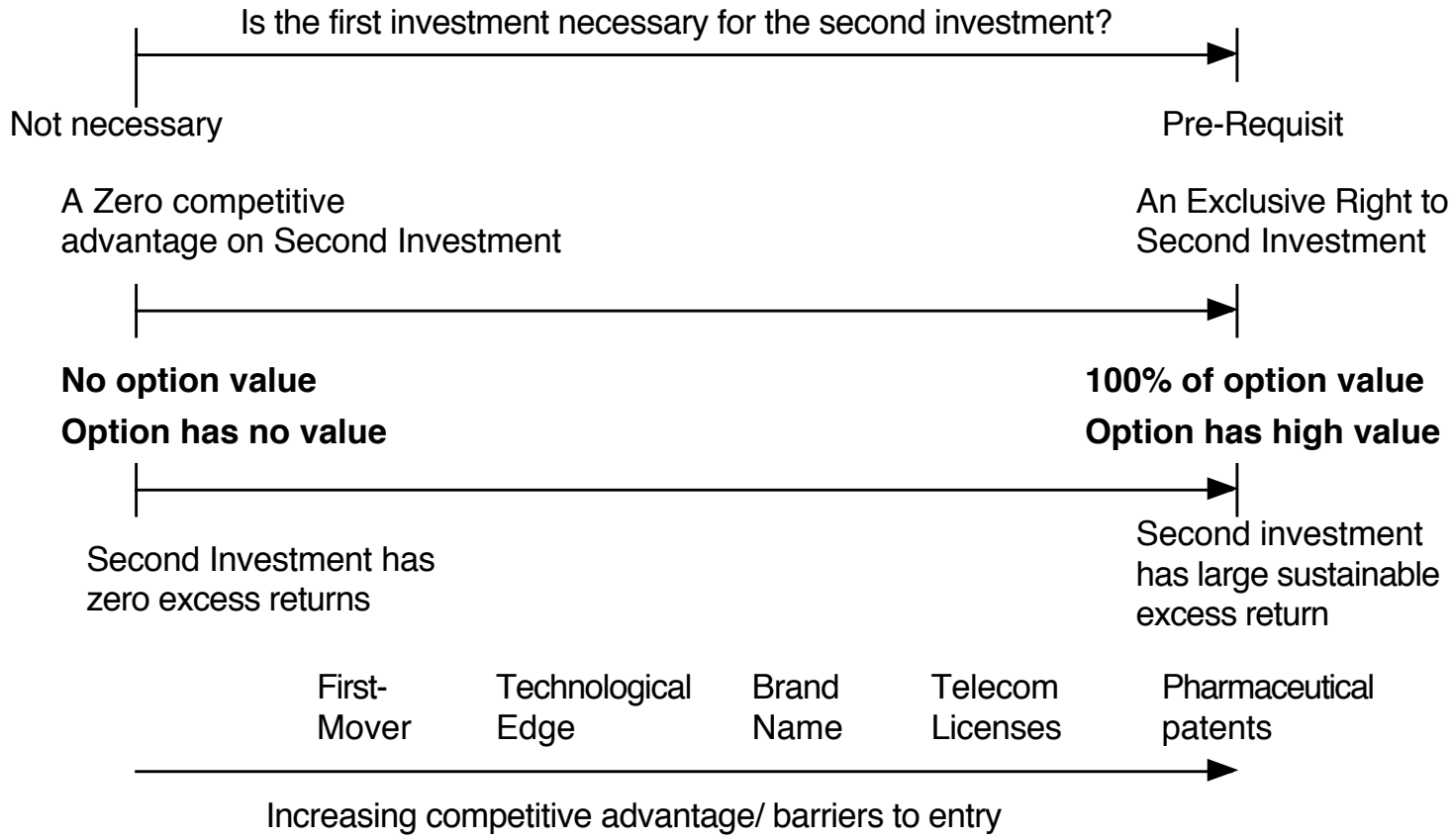
- Call Value= $ 56 Million

DCF valuation of the firm = $ 115 million

Value of Option to Expand to Database market = $ 56 million

Value of the company with option to expand = $ 171 million

A NOTE OF CAUTION: OPPORTUNITIES ARE NOT OPTIONS...

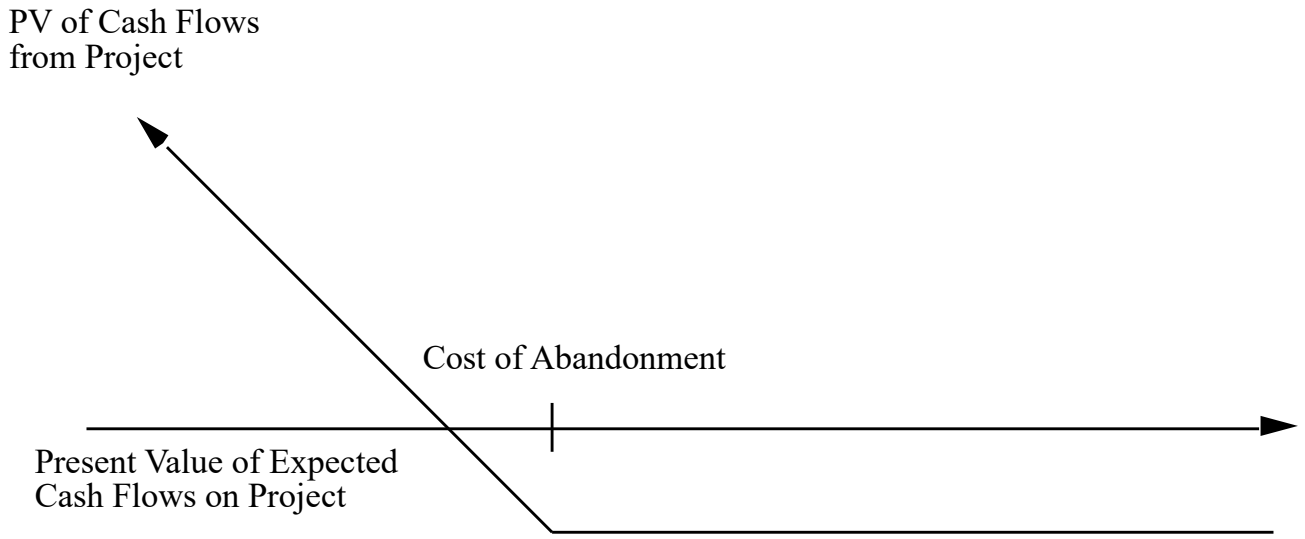


THE REAL OPTIONS TEST FOR EXPANSION OPTIONS

- The Options Test
  - Underlying Asset: Expansion Project
  - Contingency
  - If PV of CF from expansion > Expansion Cost: PV - Expansion Cost
  - If PV of CF from expansion < Expansion Cost: 0
- The Exclusivity Test
  - Barriers may range from strong (exclusive licenses granted by the government) to weaker (brand name, knowledge of the market) to weakest (first mover).
- The Pricing Test
  - Underlying Asset: As with patents, there is no trading in the underlying asset and you have to estimate value and volatility.
  - Option: Licenses are sometimes bought and sold, but more diffuse expansion options are not.
  - Cost of Exercising the Option: Not known with any precision and may itself evolve over time as the market evolves.
- Using option pricing models to value expansion options will not only yield extremely noisy estimates, but may attach inappropriate premiums to discounted cashflow estimates.

C. THE OPTION TO ABANDON

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



VALUING THE OPTION TO ABANDON

- Airbus is considering a **joint venture with Lear Aircraft** to produce a small commercial airplane (capable of carrying 40-50 passengers on short haul flights)
  - Airbus will have to **invest $ 500 million for a 50% share of the venture**
  - Its share of the **present value of expected cash flows is 480 million.**
- Lear Aircraft, which is eager to enter into the deal, offers to buy Airbus's 50% share of the investment anytime over the next five years **for $ 400 million**, if Airbus decides to get out of the venture.
- A simulation of the cash flows on this time share investment yields a **variance** in the present value of the cash flows from being in the partnership **is 0.16.**
- The project has a **life of 30 years.**

PROJECT WITH OPTION TO ABANDON

- Value of the Underlying Asset (S)
  = PV of Cash Flows from Project = $ 480 million
- Strike Price (K)
  = Salvage Value from Abandonment = $ 400 million
- Variance in Underlying Asset's Value = 0.16
- Time to expiration = Life of the Project =5 years
- Dividend Yield = **1/Life of the Project = 1/30 = 0.033**
- The five-year riskless rate is 6%.

SHOULD AIRBUS ENTER INTO THE JOINT VENTURE?

- Value of Put =Ke-rt (1-N(d2))- Se-yt (1-N(d1))
  =400 $\exp^{(-0.06)(5)}$ (1-0.4624) - 480 $\exp^{(-0.033)(5)}$ (1-0.7882)
  = $ 73.23 million
- The value of this abandonment option has to be added on to the net present value of the project of -$ 20 million, yielding a total net present value with the abandonment option of $ 53.23 million.
- While this is what Lear Aircraft wants from the deal, it has to have a large enough net present value of the cost of the put option.

IMPLICATIONS FOR INVESTMENT ANALYSIS/ VALUATION

- Having a option to abandon a project can **make otherwise unacceptable projects acceptable.**
- Other things remaining equal, you would attach more value to companies with
  - **More cost flexibility**, that is, making more of the costs of the projects into variable costs as opposed to fixed costs.
  - **Fewer long-term contracts/obligations** with employees and customers, since these add to the cost of abandoning a project.
- These actions will undoubtedly cost the firm some value, but this has to be **weighed off against the increase in the value of the abandonment option.**

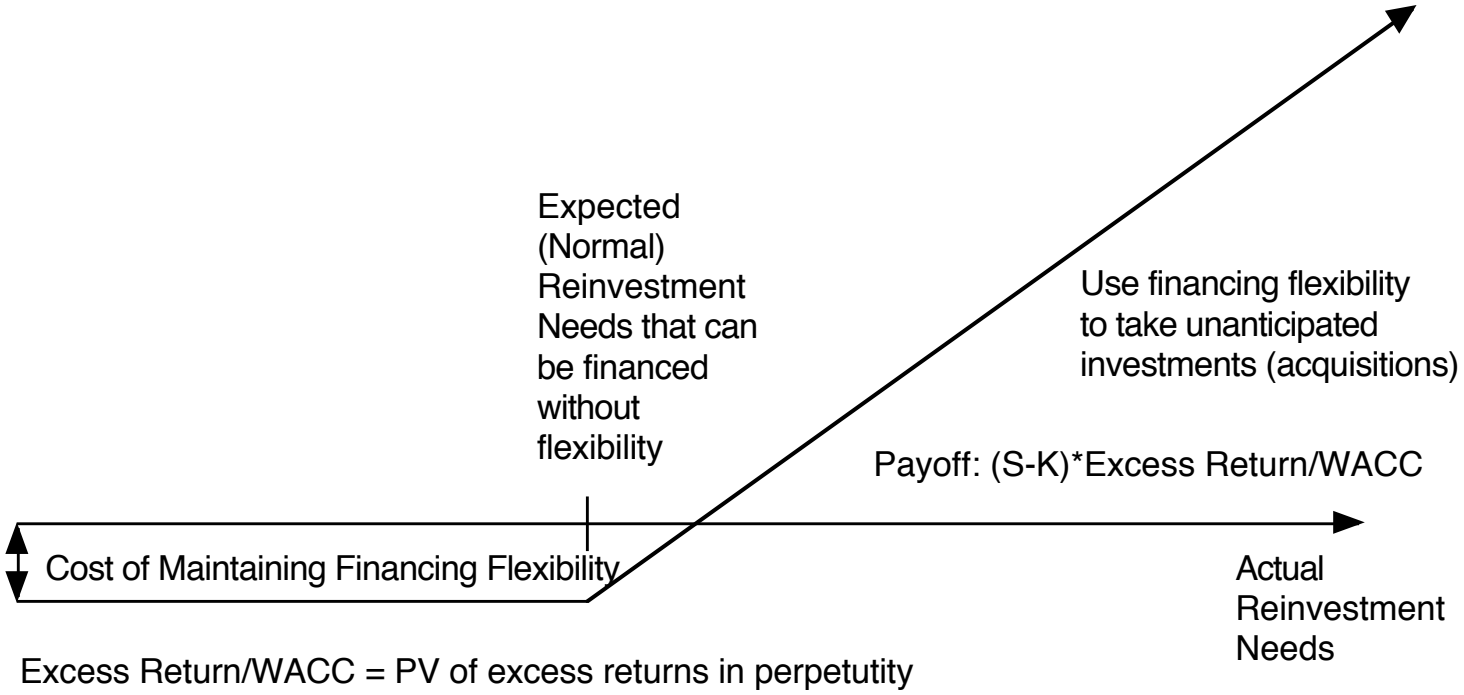
D. OPTIONS IN CAPITAL STRUCTURE

- The most direct applications of option pricing in capital structure decisions is in the **design of securities.** In fact, most complex financial instruments can be broken down into some combination of a simple bond/common stock and a variety of options.
  - If these securities are **to be issued to the public**, and traded, the options must be priced.
  - If these are **non-traded instruments** (bank loans, for instance), they still have to be priced into the interest rate on the instrument.
- The other application of option pricing is in valuing flexibility. Often, firms preserve debt capacity or hold back on issuing debt because they want to maintain flexibility.

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.

THE VALUE OF FLEXIBILITY



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%

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%
s^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

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.
- 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.

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.