

New York University  
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***Option-Based  
Corporate Valuation***

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***What's a Company Worth?***

- Required returns
- Types of Models
  - ◆ Balance sheet models
  - ◆ Dividend discount models
  - ◆ Corporate cash flow models
  - ◆ Price/Earnings ratios
- Estimating Growth Rates
- Application

The IBM logo is displayed in its characteristic red, white, and blue striped font, positioned to the right of the main list of topics.

## What's a Company Worth? Alternative Models

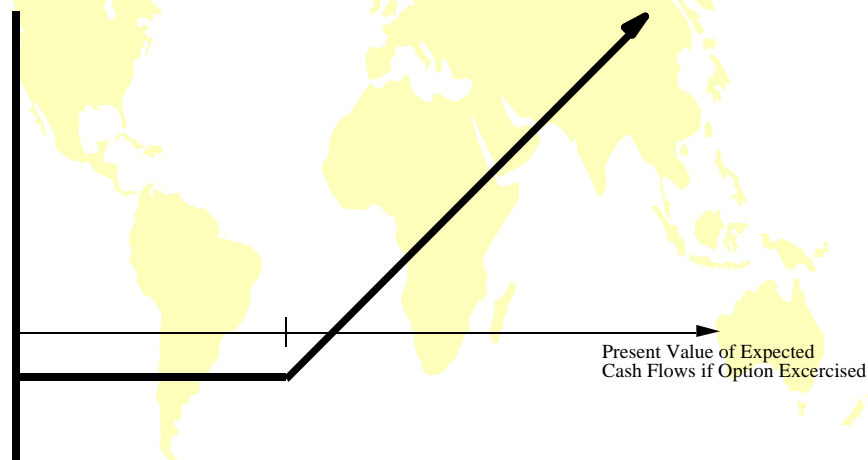
- The options approach
  - ◆ Option to expand
  - ◆ Option to abandon
- Creation of key resources that another company would pay for
  - ◆ Patents or trademarks
  - ◆ Teams of employees
  - ◆ Customers
- *Examples?*

*Lycos*

*Messageclick.com*

## What's a Company Worth? The Options Approach

Value of the Firm or project



## 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.

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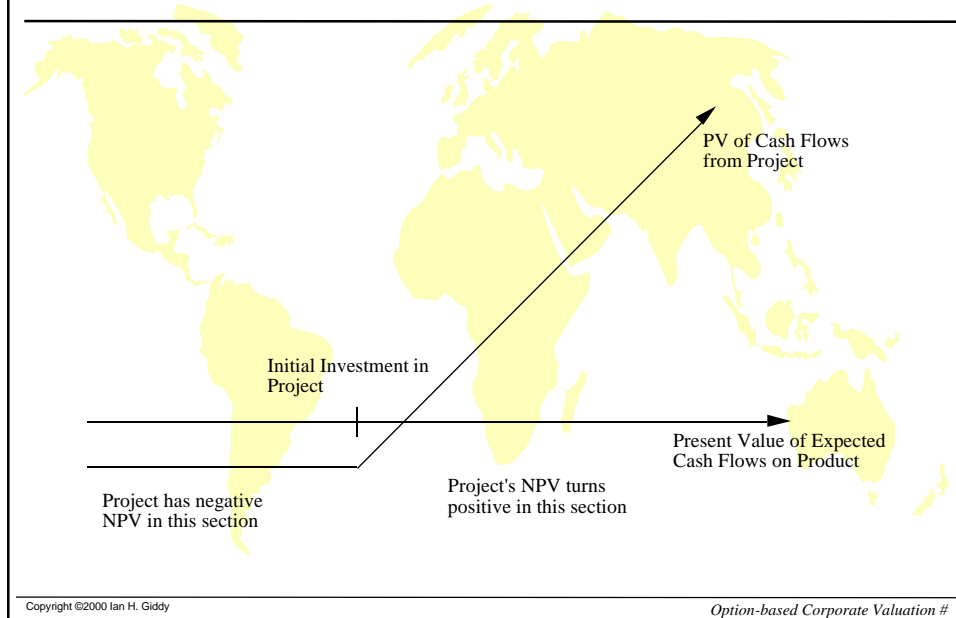
## The Option to Delay

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

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## Valuing the Option to Delay a Project



## 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.

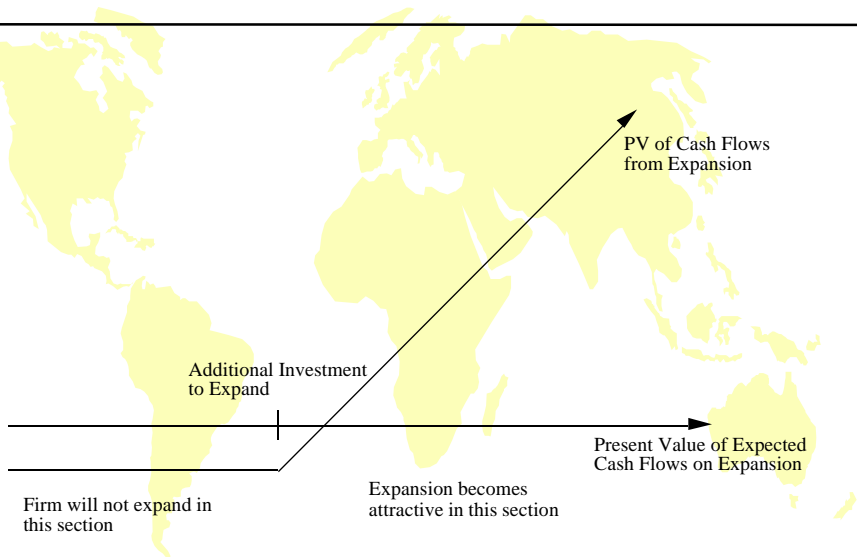
## *The Option to Expand/Take Other Projects*

- 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) provides a more-than-compensating value.
- These are the options that firms often call “strategic options” and use as a rationale for taking on “negative NPV” or even “negative return” projects.

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## *The Option to Expand*



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## An Example of a Corporate Option

- J&J is considering investing \$110 million to purchase an internet distribution company to serve the growing on-line market.
- A conventional NPV financial analysis of the cash flows from this investment suggests that the present value of the cash flows from this investment to J&J will be only \$95 million. Thus, by itself, the corporate venture has a **negative NPV of \$15 million**.
- If the on-line market turns out to be more lucrative than currently anticipated, J&J **could expand** its reach a global on-line market with **an additional investment of \$125 million** any time over the next 2 years. While the current expectation is that the PV of cash flows from having a worldwide on-line distribution channel is only **\$100 million** (still negative NPV), there is considerable uncertainty about both the potential for such a channel and the shape of the market itself, leading to significant variance in this estimate.
- ***This uncertainty is what makes the corporate venture valuable!***

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Option-based Corporate Valuation #

## Valuing the Corporate Venture Option

- *The corporate option would cost an expected \$15 million. But what is it worth to J&J?*
- Value of the underlying asset (S) = PV of cash flows from purchase of on-line selling venture, if done now = \$100 Million
- Strike Price (K) = cost of expansion into global on-line selling = \$125 Million
- We estimate the variance in the estimate of the project value by using the annualized volatility (standard deviation) in firm value of publicly traded on-line marketing firms in the global markets, which is approximately 50%.
  - ◆ Variance in Underlying Asset's Value =  $SD^2 = .25$
- Time to expiration = Period for which "venture option" applies = 2 years
- 2-year interest rate: 6.5%

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## ***Black-Scholes Option Valuation***

$$\text{Call value} = S_0 N(d_1) - X e^{-rT} N(d_2)$$

$$d_1 = [\ln(S_0/X) + (r + \sigma^2/2)T] / (\sigma T^{1/2})$$

$$d_2 = d_1 - (\sigma T^{1/2})$$

where

$S_0$  = Current stock price

$X$  = Strike price,  $T$  = time,  $r$  = interest rate

$N(d)$  = probability that a random draw from a normal distribution will be less than  $d$ .

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Option-based Corporate Valuation #

## ***Valuing the Corporate Venture Option***

- Value of the underlying asset ( $S$ ) = PV of cash flows from purchase of on-line selling venture, if done now = \$100 Million
- Strike Price ( $X$ ) = cost of expansion into global on-line selling = \$125 Million
- We estimate the variance in the estimate of the project value by using the annualized standard deviation in firm value of publicly traded on-line marketing firms in the global markets, which is approximately 50%.
  - ◆ Variance in Underlying Asset's Value =  $SD^2=0.25$
- Time to expiration = Period for which "venture option" applies = 2 years
- 2-year interest rate: 6.5%

$$\begin{aligned} \text{Call Value} &= 100 N(d_1) - 125 (\exp(-0.065)(2)) N(d_2) \\ &= \$ 24.2 \text{ Million} \end{aligned}$$

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**Conclusion?**

**Johnson & Johnson should go ahead and invest in the venture -- the value of the option (\$24 million) exceeds the cost (\$15 million)**

**Can this approach be used to value highly speculative ventures?**

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