Measuring Investment Returns

Aswath Damodaran

Stern School of Business

First Principles

- Invest in projects that **yield a return greater** than the minimum acceptable hurdle rate.
  - The hurdle rate should be higher for riskier projects and reflect the financing mix used - owners' funds (equity) or borrowed money (debt)
  - **Returns on projects should be measured based on cash flows generated and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.**
- Choose a financing mix that minimizes the hurdle rate and matches the assets being financed.
- If there are not enough investments that earn the hurdle rate, return the cash to stockholders.
  - The form of returns - dividends and stock buybacks - will depend upon the stockholders' characteristics.

Objective: Maximize the Value of the Firm

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.

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: Opportunity Costs

- Assume that Disney owns land in Bangkok 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 Bangkok. 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:
  - Ignore the cost of the land, since Disney owns its already
  - Use the book value of the land, which is $ 5 million
  - Use the market value of the land, which is $ 40 million
  - Other:

Case 2: 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?
  - Yes
  - No

Estimating the Cost of Excess Capacity

- Existing Capacity = 100,000 units
- Current Usage = 50,000 (50% of Capacity); 50% Excess Capacity;
- New Product will use 30% of Capacity; Sales growth at 5% a year; CM per unit = $5/unit
- Book Value = $1,000,000 Cost of a building new capacity = $1,500,000 Cost of Capital = 12%
- Current product sales growing at 10% a year. CM per unit = $4/unit
- Basic Framework
  - If I do not take this product, when will I run out of capacity?
  - If I take thisproject, when will I run out of capacity
  - When I run out of capacity, what will I do?
    - cut back on production: cost is PV of after-tax cash flows from lost sales
    - buy new capacity: cost is difference in PVbetween 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	107.18%	44.32%	151.50%	$ 206,000	$ 74,286
10	117.90%	46.54%	164.44%	$ 257,760	$ 82,992
				PV(LOST SALES)=	**$ 336,734**

- 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 = $ 336,734

Costs for Other Projects

- Projects often create side-costs for other projects. The key question that has to be asked then is: Is this an incremental cost, as a result of the project, or would it have occurred anyway?
- If it is an incremental cost, it should be considered in project analysis. If it would have occurred anyway, it should be ignored.

Product and Project Cannibalization: A Real Cost?

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

- Look at only incremental revenues (i.e. 80% of the total revenue)
- Look at total revenues at the park
- 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)?

- Yes
- No

Project Synergies

- A project may provide benefits for other projects within the firm. If this is the case, these benefits have to be valued and shown in the initial project analysis.
- 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

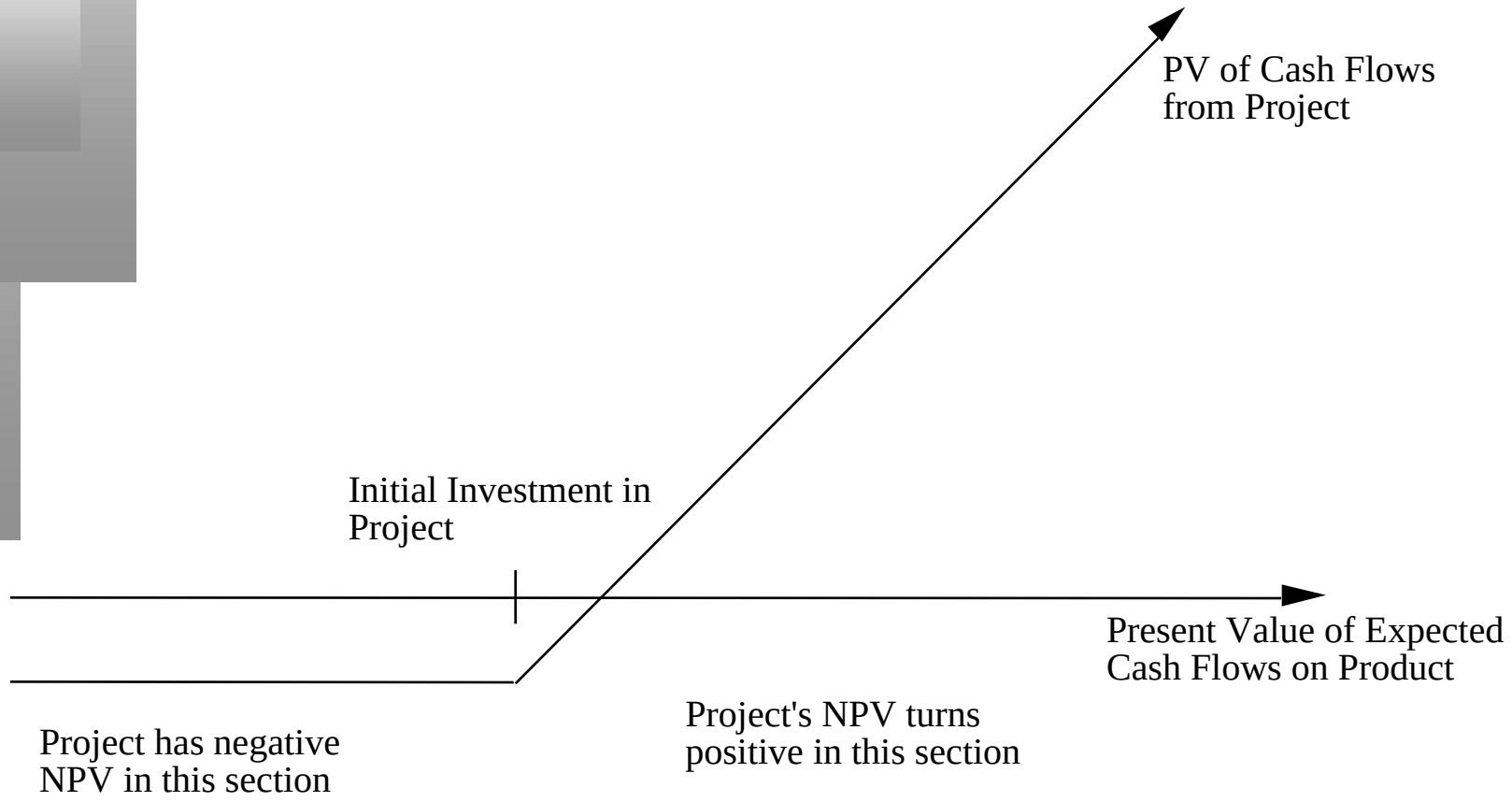
Project Options

- 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.
- Thus, the fact that a project does not pass muster today (because its NPV is negative, or its IRR is less than its hurdle rate) does not mean that the rights to this project are not valuable.

Valuing the Option to Delay a Project



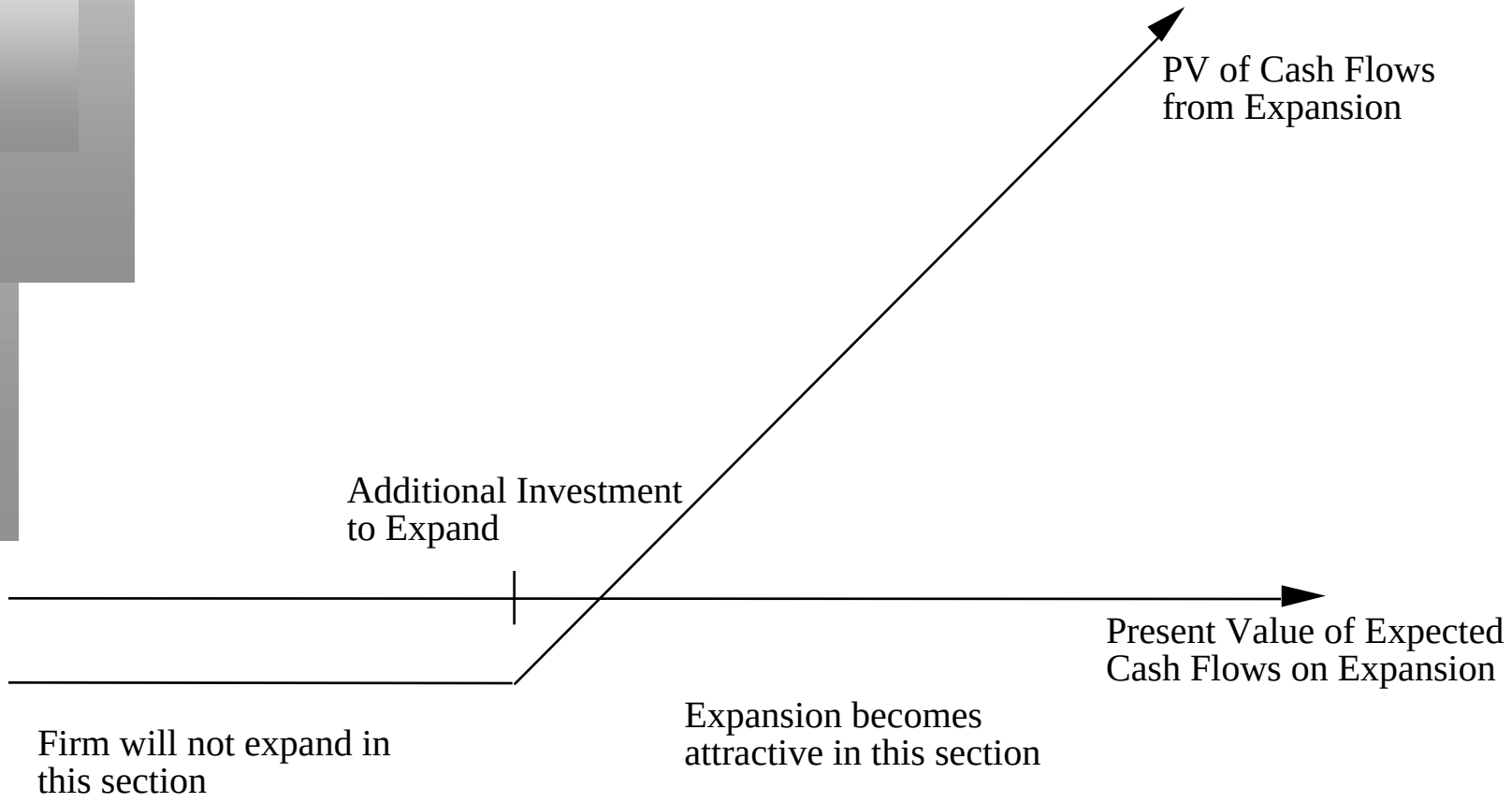
Insights for Investment Analyses

- 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.

The Option to Expand



An Example of an Expansion Option

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

Valuing the Expansion Option

- Value of the Underlying Asset (S) = PV of Cash Flows from Expansion to Latin America, if done now =$ 100 Million
- Strike Price (K) = Cost of Expansion into Latin American = $ 150 Million
- We estimate the variance in the estimate of the project value by using the annualized variance in firm value of publicly traded entertainment firms in the Latin American markets, which is approximately 10%.
  - Variance in Underlying Asset's Value = 0.10
- Time to expiration = Period for which expansion option applies = 10 years

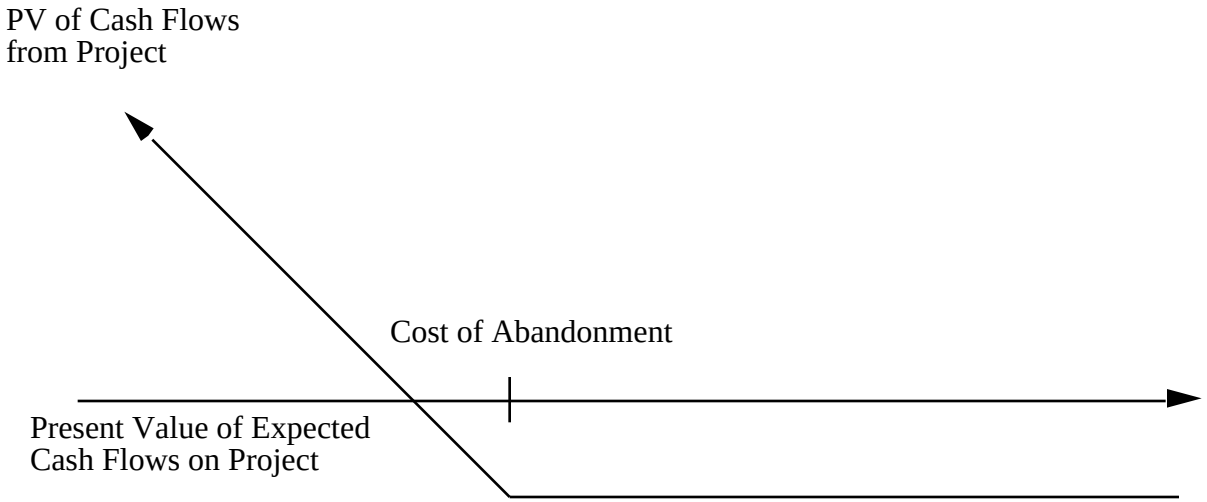
Call Value= 100 (0.7915) -150 (exp(-0.065)(10) (0.3400)= $ 52.5 Million

Considering the Project with Expansion Option

- NPV of Disney Channel in Mexico = $ 80 Million - $ 100 Million = - $ 20 Million
- Value of Option to Expand = $ 52.5 Million
- NPV of Project with option to expand
  = - $ 20 million + $ 52.5 million
  = $ 32.5 million
- **Take the project**

The Option to Abandon

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



Valuing the Option to Abandon

- Disney is considering taking a 25-year project which
  - requires an initial investment of $ 250 million in an real estate partnership to develop time share properties with a South Florida real estate developer,
  - has a present value of expected cash flows is $ 254 million.
- While the net present value of $ 4 million is small, assume that Disney has the option to abandon this project anytime by selling its share back to the developer in the next 5 years for $ 150 million.
- A simulation of the cash flows on this time share investment yields a variance in the present value of the cash flows from being in the partnership is 0.09.

Project with Option to Abandon

- Value of the Underlying Asset (S) = PV of Cash Flows from Project = $ 254 million
- Strike Price (K) = Salvage Value from Abandonment = $ 150 million
- Variance in Underlying Asset's Value = 0.09
- Time to expiration = Life of the Project =5 years
- Dividend Yield = 1/Life of the Project = 1/25 = 0.04 (We are assuming that the project's present value will drop by roughly 1/n each year into the project)
- Assume that the five-year riskless rate is 7%. The value of the put option can be estimated as follows:

Should Disney take this project?

- Call Value = 254 exp(0.04)(5) (0.9105) -150 (exp(-0.07)(5) (0.7496) = $ 110.12 million
- Put Value= $ 110.12 - 254 exp(0.04)(5) +150 (exp(-0.07)(5) = $ 7.86 million
- The value of this abandonment option has to be added on to the net present value of the project of $ 4 million, yielding a total net present value with the abandonment option of $ 11.86 million.

Back to First Principles

- Invest in projects that **yield a return** greater than the minimum acceptable hurdle rate.
  - The hurdle rate should be higher for riskier projects and reflect the financing mix used - owners' funds (equity) or borrowed money (debt)
  - **Returns on projects should be measured based on cash flows generated and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.**
- Choose a financing mix that minimizes the hurdle rate and matches the assets being financed.
- If there are not enough investments that earn the hurdle rate, return the cash to stockholders.
  - The form of returns - dividends and stock buybacks - will depend upon the stockholders' characteristics.