Measuring Investment Returns

"Show me the money"

from *Jerry Maguire*

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.

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"

Earnings versus Cash Flows: A Disney Theme Park

- The theme parks to be built near Bangkok, modeled on Euro Disney in Paris, 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

	Depreciation as % of book value	Capital maintenance as % of depreciation
1	0.00%	0.00%
2	12.70%	50.00%
3	11.21%	60.00%
4	9.77%	70.00%
5	8.29%	80.00%
6	8.31%	90.00%
7	8.34%	100.00%
8	8.38%	105.00%
9	8.42%	110.00%
10	8.42%	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 37.3%.

Earnings on Project

	Now (0)	1	2	3	4	5	6	7	8	9	10
Magic King dom		$0	$1,000	$1,400	$1,700	$2,000	$2,200	$2,420	$2,662	$2,928	$2,987
Second The me Park		$0	$0	$0	$300	$500	$550	$605	$666	$732	$747
Resort & Prop erties		$0	$250	$350	$500	$625	$688	$756	$832	$915	$933
Total Revenues			*$1,250*	*$1,750*	*$2,500*	*$3,125*	*$3,438*	*$3,781*	*$4,159*	*$4,575*	*$4,667*
Magic Kingdom: Operating Expenses		$0	$600	$840	$1,020	$1,200	$1,320	$1,452	$1,597	$1,757	$1,792
Epcot II: Operating Expenses		$0	$0	$0	$180	$300	$330	$363	$399	$439	$448
Resort & Prop erty: Operating Expenses		$0	$188	$263	$375	$469	$516	$567	$624	$686	$700
Depreciation & Amortization		$0	$537	$508	$430	$359	$357	$358	$361	$366	$369
Allocated G&A Costs		$0	$188	$263	$375	$469	$516	$567	$624	$686	$700
Operating Income		*$0*	*-$262*	*-$123*	*$120*	*$329*	*$399*	*$473*	*$554*	*$641*	*$657*
Taxes		$0	-$98	-$46	$45	$123	$149	$177	$206	$239	$245
Operating Incom e after Taxes			-$164	-$77	$75	$206	$250	$297	$347	$402	$412

And the Accounting View of Return

Year	After-tax Operating Income	BV of Capital: Beginning	BV of Capital: Ending	Average BV of Capital	ROC
1	$0	$2,500	$3,500	$3,000	NA
2	-$165	$3,500	$4,294	$3,897	-4.22%
3	-$77	$4,294	$4,616	$4,455	-1.73%
4	$75	$4,616	$4,524	$4,570	1.65%
5	$206	$4,524	$4,484	$4,504	4.58%
6	$251	$4,484	$4,464	$4,474	5.60%
7	$297	$4,464	$4,481	$4,472	6.64%
8	$347	$4,481	$4,518	$4,499	7.72%
9	$402	$4,518	$4,575	$4,547	8.83%
10	$412	$4,575	$4,617	$4,596	8.97%
	$175			$4,301	4.23%

What should this return be compared to?

- The computed return on capital on this investment is 4.23%. 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 4% (T. Bond rate)
  - The cost of equity for Disney as a company (10%) (See page 187)
  - The cost of equity for Disney theme parks (9.12%) (See page 187)
  - The cost of capital for Disney as a company (8.59%) (See page 187)
  - The cost of capital for Disney theme parks (7.90%) (See page 187)
  - None of the above

Estimating a hurdle rate for the theme park

- We did estimate a cost of equity of 9.12% for the Disney theme park business, using a bottom-up levered beta of 1.0625 for the business.
- This cost of equity may not adequately reflect the additional risk associated with the theme park being in an emerging market.
- To count this risk, we compute the cost of equity for the theme park using a risk premium that includes a country risk premium for Thailand:
  - The rating for Thailand is Baa1 and the default spread for the country bond is 1.50%.
  - Multiplying this by the relative volatility of 2.2 of the equity market in Thailand (standard deviation of equity/standard deviation of country bond) yields a country risk premium of 3.3%.

    Cost of Equity in US $= 4% + 1.0625 (4.82% + 3.30%) = 12.63%

    Cost of Capital in US $ = 12.63% (.7898) + 3.29% (.2102) = 10.66%

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 is 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 Thailand (or any other emerging market)

Would lead us to conclude that...

- Do not invest in this park. The **return on capital of 4.23%** is lower than the **cost of capital for theme parks of 10.66%**; 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

From Project to Firm Return on Capital: Disney in 2003

- Just as a comparison of project return on capital to the cost of capital yields a measure of whether the project is acceptable, a comparison can be made at the firm level, to judge whether the existing projects of the firm are adding or destroying value.
- Disney, in 2003, had earnings before interest and taxes of $2,713 million, had a book value of equity of $23,879 million and a book value of debt of 14,130 million. With a tax rate of 37.3%, we get

  Return on Capital = 2713(1-.373)/ (23879+14130) = 4.48%

  Cost of Capital for Disney= 8.59%

  Excess Return = 4.48%-8.59% = -4.11%
- This can be converted into a dollar figure by multiplying by the capital invested, in which case it is called economic value added

  EVA = (.0448-.0859) (23879+14130) = -$1,562 million

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

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

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

Return Spread = After-tax ROC - Cost of Capital

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

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

The cash flow view of this project..

	0	1	2	3	4	5	6
Operating Income after Taxes			-$165	-$77	$75	$206	$251
+ Depreciation & Amortization			$537	$508	$430	$359	$357
- Capital Expenditures	$2,500	$1,000	$1,269	$805	$301	$287	$321
- Change in Working Capital	$0	$0	$63	$25	$38	$31	$16
Cashflow to Firm	-$2,500	-$1,000	-$960	-$399	$166	$247	$271

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:

  Tax Benefit = Depreciation * Tax Rate
- For example, in year 2, the tax benefit from depreciation to Disney from this project can be written as:

  Tax Benefit in year 2 = $ 537 million (.373) = $ 200 million

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?
  a) Straight Line Depreciation
  b) Accelerated Depreciation

Which will result in higher cash flows this year?

a) Straight Line Depreciation
b) 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 suppliers 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.

The incremental cash flows on the project

$ 500 million has already been spent

	Now (0)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Operating Income after Taxes			-$165	-$77	$75	$206	$251	$297	$347	$402	$412
+ Depreciation & Amortization			$537	$508	$430	$359	$357	$358	$361	$366	$369
- Capital Expenditures	$2,500	$1,000	$1,269	$805	$301	$287	$321	$358	$379	$403	$406
- Change in Working Capital	$0	$0	$63	$25	$38	$31	$16	$17	$19	$21	$5
+ Non-incremental Allocated Expense (1-t)		$0	$78	$110	$157	$196	$216	$237	$261	$287	$293
+ Sunk Costs	500										
Cashflow to Firm	-$2,000	-$1,000	-$880	-$289	$324	$443	$486	$517	$571	$631	$663

2/3rd of allocated G&A is fixed.
Add back this amount (1-t)
Tax rate = 37.3%

To get from cash flow to incremental cash flows, we

- Taken out of the sunk costs from the initial investment
- Added back the non-incremental allocated costs (in after-tax terms)

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.

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 in year 11/(Cost of Capital - Growth Rate)
    =663 (1.02) /(.1066-.02) = $ 7,810 million

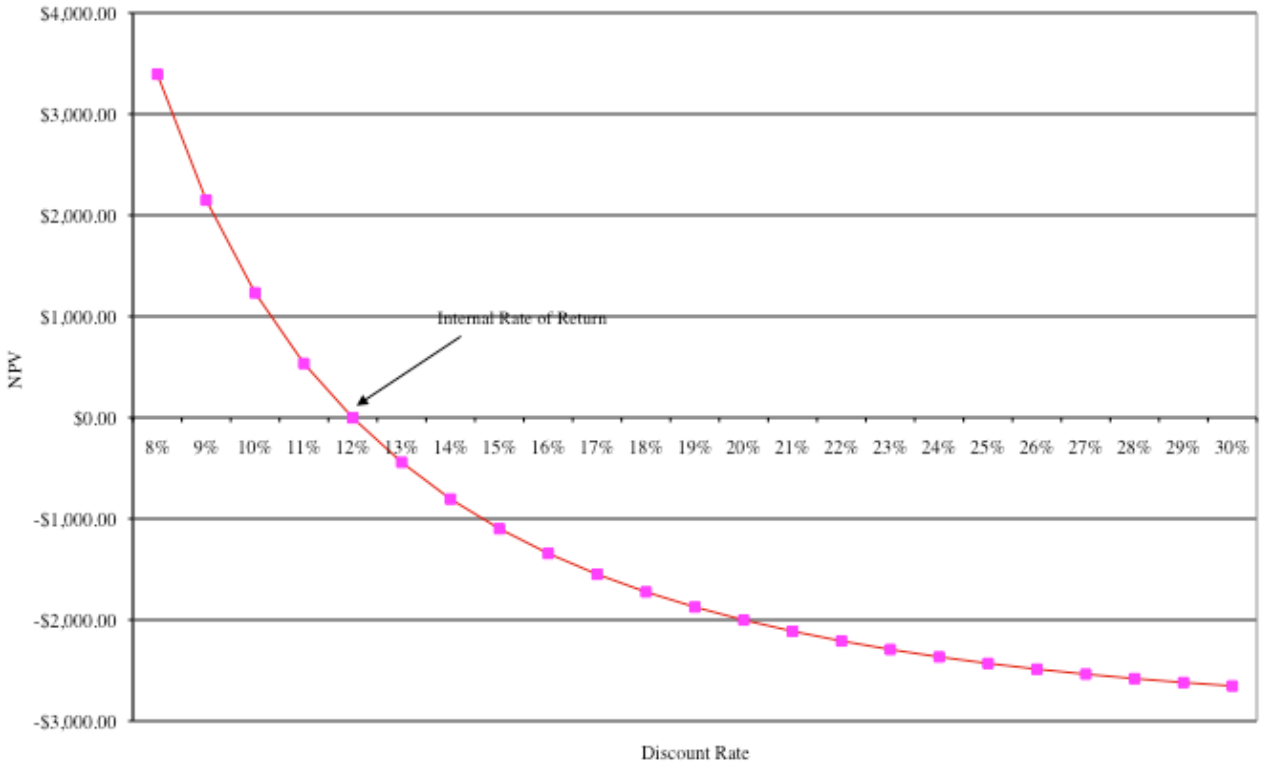
Which yields a NPV of..

Year	Annual Cashflow	Terminal Value	Present Value
0	-$2,000		-$2,000
1	-$1,000		-$904
2	-$880		-$719
3	-$289		-$213
4	$324		$216
5	$443		$267
6	$486		$265
7	$517		$254
8	$571		$254
9	$631		$254
10	$663	$7,810	$3,076
			$749

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 $749 million.

The IRR of this project



The IRR suggests..

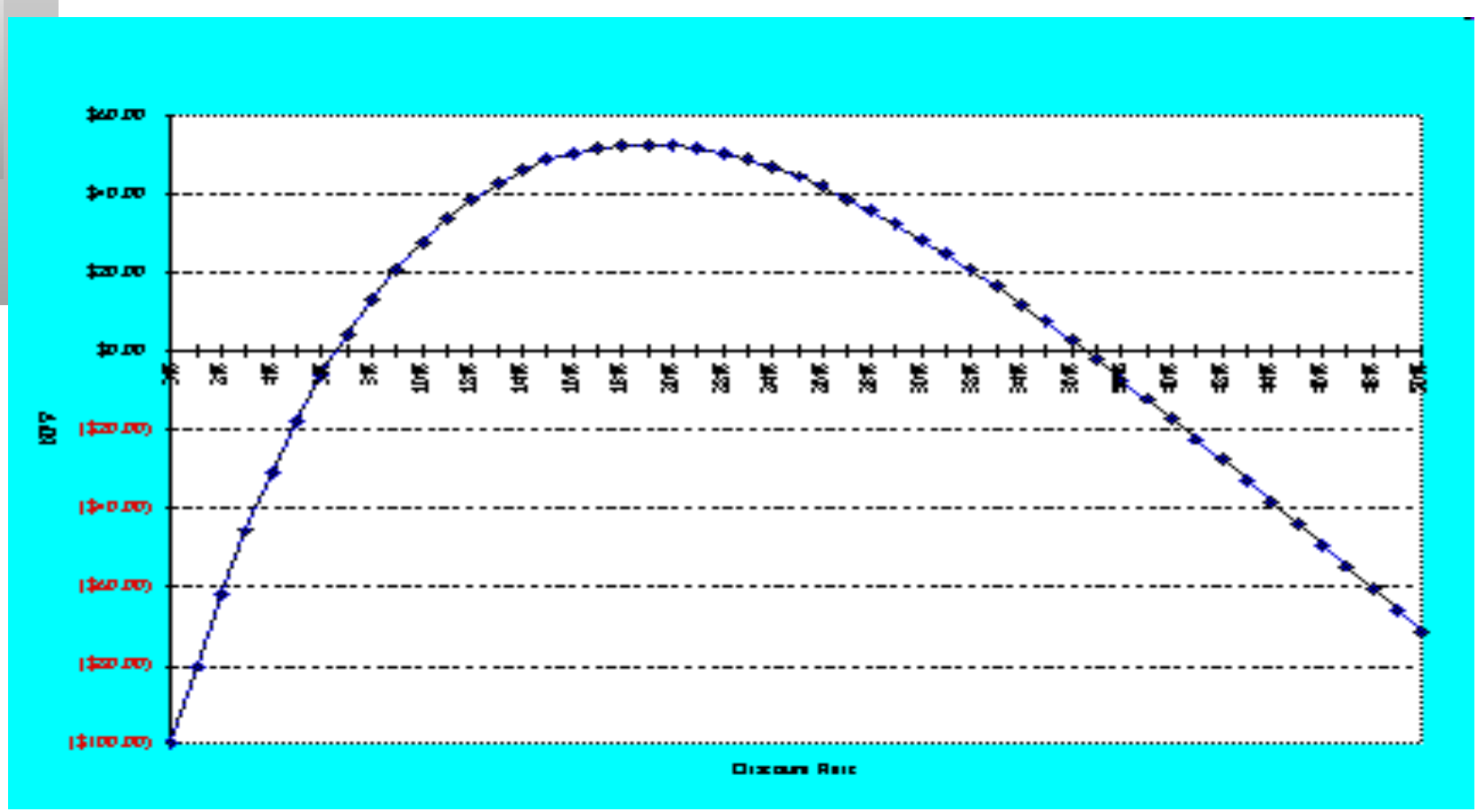
- **The project is a good one**. Using time-weighted, incremental cash flows, this project provides a return of 11.97%. This is greater than the cost of capital of 10.66%.
- The IRR and the NPV will yield **similar results** most of the time, though there are differences between the two approaches that may cause project rankings to vary depending upon the approach used.

Case 1: IRR versus NPV

- Consider a project with the following cash flows:

Year	*Cash Flow*
0	-1000
1	800
2	1000
3	1300
4	-2200

Project's NPV Profile



What do we do now?

- This project has two internal rates of return. The first is 6.60%, whereas the second is 36.55%.
- Why are there two internal rates of return on this project?

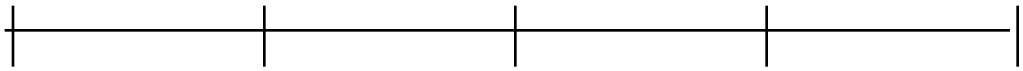
- If your cost of capital is 12%, would you accept or reject this project?
  a) I would reject the project
  b) I would accept this project

Explain.

Case 2: NPV versus IRR

Project A

Cash Flow $ 350,000 $ 450,000 $ 600,000 $ 750,000

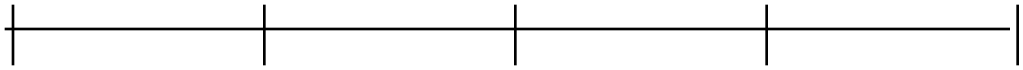


Investment $ 1,000,000

NPV = $467,937
IRR= 33.66%

Project B

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…

Cause	*Number of firms*	*Percent of total*
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

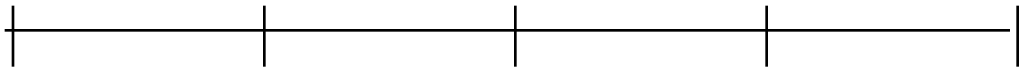
- The problem with the NPV rule, when there is capital rationing, is that it is a dollar value. It measures success in absolute terms.
- The NPV can be converted into a relative measure by dividing by the initial investment. This is called the profitability index.
  - Profitability Index (PI) = NPV/Initial 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

Project A

Cash Flow $ 5,000,000 $ 4,000,000 $ 3,200,000 $ 3,000,000

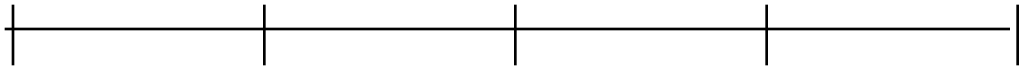


Investment $ 10,000,000

NPV = $1,191,712
IRR=21.41%

Project B

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%

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?

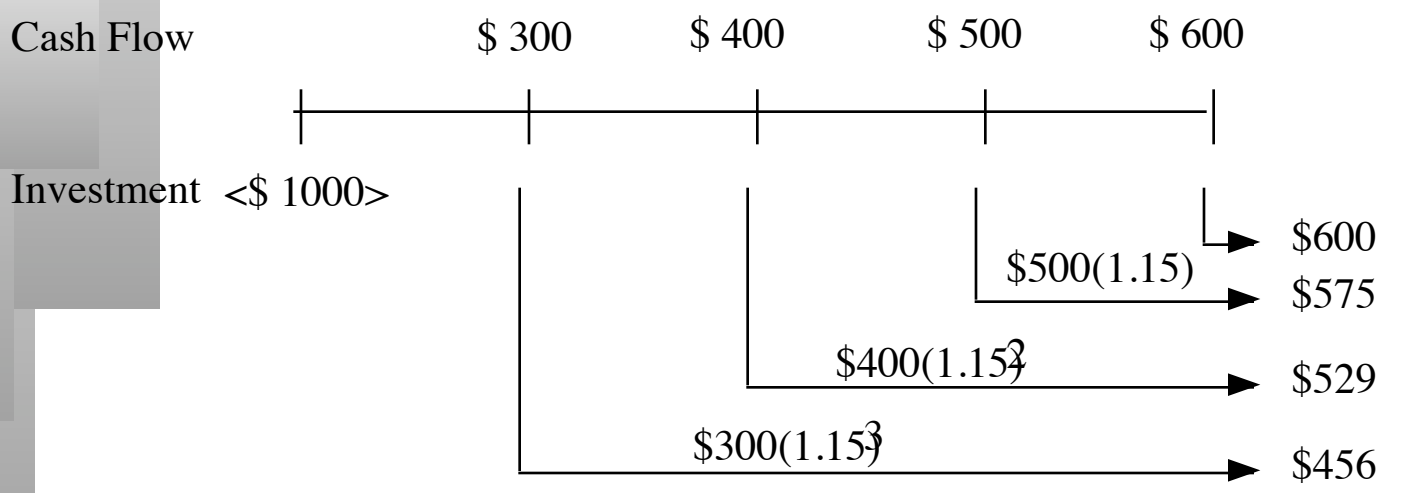
Which one would you pick?

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



Terminal Value = $2160

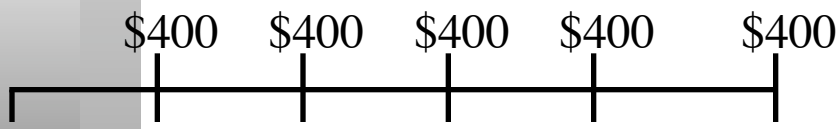
Internal Rate of Return = 24.89%
Modified Internal Rate of Return = 21.23%

Why NPV and IRR may differ..

- 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”.

Case 4: NPV and Project Life

Project A



-$1000

NPV of Project A = $ 442

Project B

-$1500

NPV of Project B = $ 478

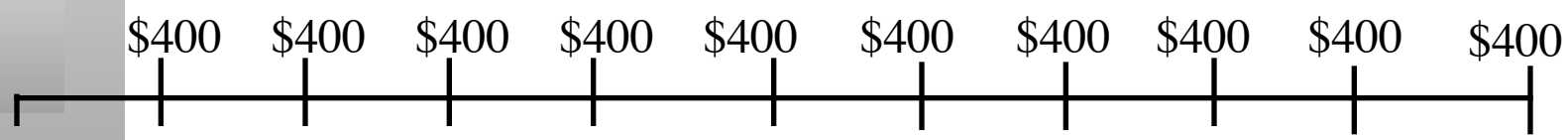
Hurdle Rate for Both Projects = 12%

Choosing Between Mutually Exclusive Projects

- The net present values of mutually exclusive projects with different lives cannot be compared, since there is a bias towards longer-life projects.
- To do the comparison, we have to
  - replicate the projects till they have the same life (or)
  - convert the net present values into annuities

Solution 1: Project Replication

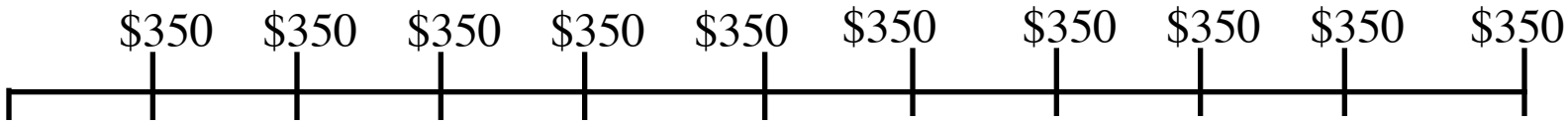
Project A: Replicated



-$1000 -$1000 (Replication)

NPV of Project A replicated = $ 693

Project B



-$1500

NPV of Project B= $ 478

Solution 2: Equivalent Annuities

- Equivalent Annuity for 5-year project
  = $442 * PV(A,12%,5 years)
  = $ 122.62
- Equivalent Annuity for 10-year project
  = $478 * PV(A,12%,10 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 ..

Decision Rule	*% of Firms using as primary decision rule in*		
	1976	1986	1998
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%

The Disney Theme Park: The Risks of International Expansion

- The cash flows on the Bangkok Disney park will be in Thai Baht. This will expose Disney to exchange rate risk. In addition, there are political and economic risks to consider in an investment in Thailand. The discount rate of 10.66% that we used reflected this additional risk. Should we adjust costs of capital any time we invest in a foreign country?
  - Yes
  - No

Domestic versus international expansion

- The analysis was done in dollars. Would the conclusions have been any different if we had done the analysis in Thai Baht?
  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 (baht), the discount rate has to be a dollar (baht) 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 Baht

- The inflation rates were assumed to be 10% in Thailand and 2% in the United States. The Baht/dollar rate at the time of the analysis was 42.09 BT/dollar.
- The expected exchange rate was derived assuming purchasing power parity.

  Expected Exchange Rate$_t$ = Exchange Rate today * $(1.10/1.02)^t$
- The expected growth rate after year 10 is still expected to be the inflation rate, but it is the 10% Thai inflation rate.
- The cost of capital in Baht was derived from the cost of capital in dollars and the differences in inflation rates:

$$\text{Baht Cost of Capital} = (1 + \text{US \$ Cost of Capital}) \frac{(1 + \text{Exp Inflation}_{\text{Thailand}})}{(1 + \text{Exp Inflation}_{\text{US}})} - 1$$

= (1.1066) (1.1/1.02) - 1 =.1934 or 19.34%

Disney Theme Park: Thai Baht NPV

Discount back at 19.34%

Year	Cashflow ($)	Bt/$	Cashflow (Bt)	Present Value
0	-2000	42.09	-84180	-84180
1	-1000	45.39	-45391	-38034
2	-880	48.95	-43075	-30243
3	-289	52.79	-15262	-8979
4	324	56.93	18420	9080
5	443	61.40	27172	11223
6	486	66.21	32187	11140
7	517	71.40	36920	10707
8	571	77.01	43979	10687
9	631	83.04	52412	10671
10	8474	89.56	758886	129470
				31542

NPV = 31,542 Bt/42.09 Bt = $ 749 Million

NPV is equal to NPV in dollar terms

Dealing with Inflation

- In our analysis, we used nominal dollar and nominal Baht cash flows. Would the NPV have been different if we had used real cash flows instead of nominal cash flows?
  a) The NPV would be much lower, since real cash flows are lower than nominal cash flows
  b) The NPV would be much higher since real discount rates will be much lower than nominal discount rates
  c) The NPV should be unaffected

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 5.25%, 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, equity terms. Thus, the hurdle rate has to be a real cost of equity
- The real cost of equity for Aracruz, based upon
  - the levered beta estimate of 0.7576 (for just the paper business)
  - the real riskless rate of 2% (US Inflation Indexed treasury bond)
  - and the risk premium for Brazil of 12.49% (US mature market premium (4.82%) + Brazil country risk premium (7.67%))

  Real Cost of Equity = 2% + 0.7576 (12.49%) = 11.46%

Breaking down debt payments by year

Year	Beginning Debt	Interest expense	Principal Repaid	Total Payment	Ending Debt
1	R$ 100,000	R$ 5,250	R$ 7,858	R$ 13,108	R$ 92,142
2	R$ 92,142	R$ 4,837	R$ 8,271	R$ 13,108	R$ 83,871
3	R$ 83,871	R$ 4,403	R$ 8,705	R$ 13,108	R$ 75,166
4	R$ 75,166	R$ 3,946	R$ 9,162	R$ 13,108	R$ 66,004
5	R$ 66,004	R$ 3,465	R$ 9,643	R$ 13,108	R$ 56,361
6	R$ 56,361	R$ 2,959	R$ 10,149	R$ 13,108	R$ 46,212
7	R$ 46,212	R$ 2,426	R$ 10,682	R$ 13,108	R$ 35,530
8	R$ 35,530	R$ 1,865	R$ 11,243	R$ 13,108	R$ 24,287
9	R$ 24,287	R$ 1,275	R$ 11,833	R$ 13,108	R$ 12,454
10	R$ 12,454	R$ 654	R$ 12,454	R$ 13,108	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	585	630	675	713	713	713	713	713	713	713
Price per ton	400	400	400	400	400	400	400	400	400	400
Revenues	*234,000*	*252,000*	*270,000*	*285,000*	*285,000*	*285,000*	*285,000*	*285,000*	*285,000*	*285,000*
Operating Expenses	178,700	188,600	198,500	206,750	206,750	206,750	206,750	206,750	206,750	206,750
Depreciation	35,000	28,000	22,400	17,920	14,336	21,469	21,469	21,469	21,469	21,469
Operating Income	20,300	35,400	49,100	60,330	63,914	56,781	56,781	56,781	56,781	56,781
- Interest	5,250	4,837	4,403	3,946	3,465	2,959	2,426	1,865	1,275	654
Taxable Income	15,050	30,563	44,697	56,384	60,449	53,822	54,355	54,916	55,506	56,127
- Taxes	5,117	10,391	15,197	19,170	20,553	18,300	18,481	18,671	18,872	19,083
Net Income	9,933	20,171	29,500	37,213	39,896	35,523	35,874	36,244	36,634	37,044

A ROE Analysis

e	Beg. BV: Assets	Deprec iation	Capital Exp.	Ending BV: Assets	BV of Working Capital	Debt	BV: Equity	Average BV: Equity	ROE
	0	0	250,000	250,000	35,100	100,000	185,100		
	250,000	35,000	0	215,000	37,800	92,142	160,658	172,879	5.75%
1	215,000	28,000	0	187,000	40,500	83,871	143,629	152,144	13.26%
0	187,000	22,400	0	164,600	42,750	75,166	132,184	137,906	21.39%
3	164,600	17,920	0	146,680	42,750	66,004	123,426	127,805	29.12%
6	146,680	14,336	50,000	182,344	42,750	56,361	168,733	146,079	27.31%
3	182,344	21,469	0	160,875	42,750	46,212	157,413	163,073	21.78%
4	160,875	21,469	0	139,406	42,750	35,530	146,626	152,020	23.60%
4	139,406	21,469	0	117,938	42,750	24,287	136,400	141,513	25.61%
4	117,938	21,469	0	96,469	42,750	12,454	126,764	131,582	27.84%
4	96,469	21,469	0	75,000	0	0	75,000	100,882	36.72%
									23.24%

Real ROE of 23.24% is greater than

Real Cost of Equity of 11.46%

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 Disney, we can compute return on equity and cost of equity at Aracruz to pass judgment on whether Aracruz is creating value to its equity investors
- In 2003 Aracruz had net income of 428 million BR on book value of equity of 6,385 million BR, yielding a return on equity of:

  ROE = 428/6,385 = 6.70% (Real because book value is inflation adjusted)

  Cost of Equity = 10.79% (Including cash)

  Excess Return = 6.70% - 10.79% = -4.09%
- This can be converted into a dollar value by multiplying by the book value of equity, to yield a equity economic value added

  Equity EVA = (6.70% - 10.79%) (6,385 Million) = -261 Million BR

An Incremental CF Analysis

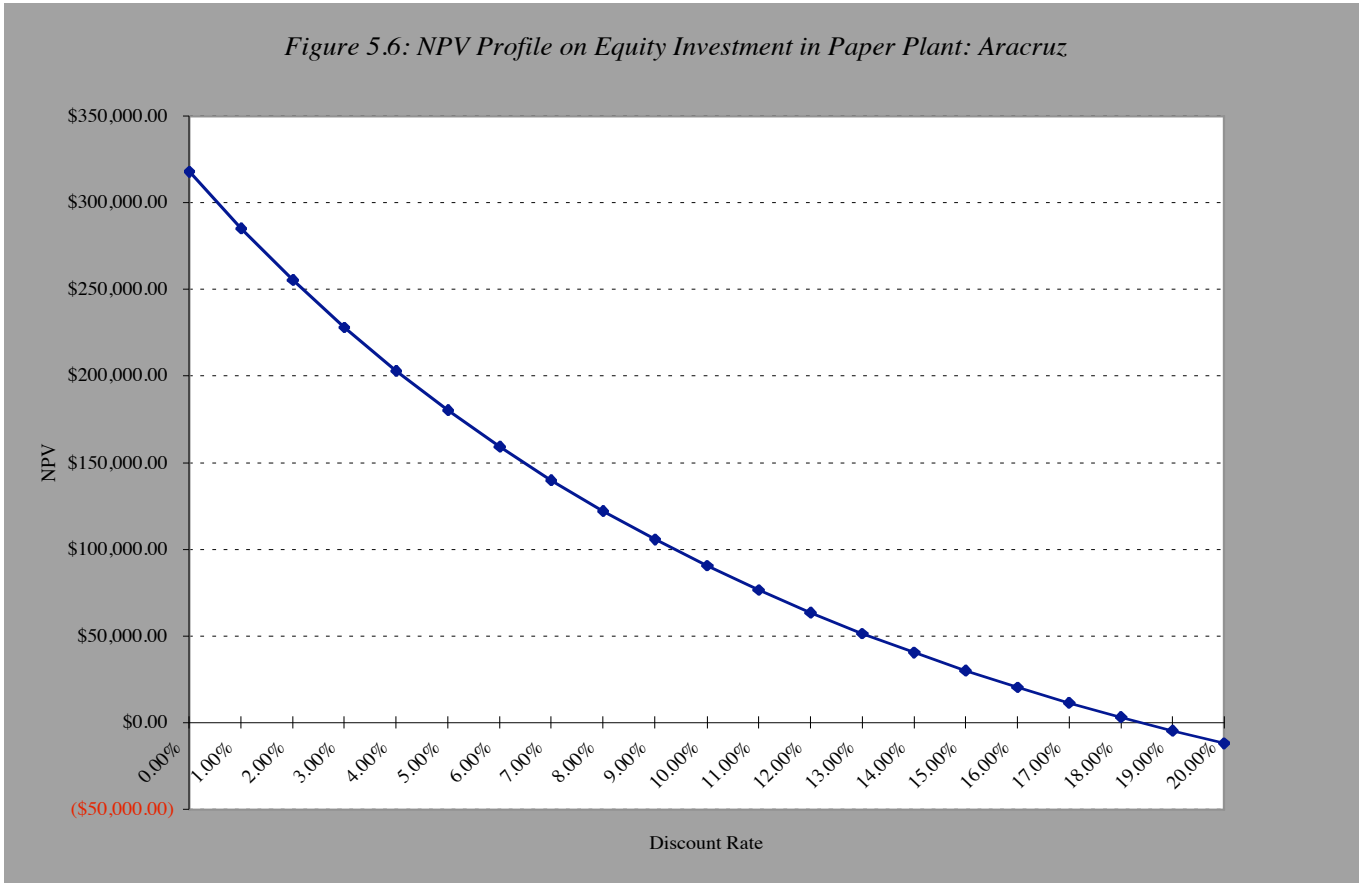
	0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Net Income		9,933	20,171	29,500	37,213	39,896	35,523	35,874	36,244 BR	36,634 BR	37,044 BR
+ Depreciation & Amortization		35,000	28,000	22,400	17,920	14,336	21,469	21,469	21,469	21,469	21,469
- Capital Expenditures	250,000	0	0	0	0	50,000	0	0	0	0	0
+ Net Debt	100,000										
- Chg Working Capital	35,100	2,700	2,700	2,250	0	0	0	0	0	0	
- Principal Repayments		7,858	8,271	8,705	9,162	9,643	10,149	10,682	11,243	11,833	12,454
+ Salvage Value of Assets[b]											117,750
Cashflow to Equity	(185,100)	34,375	37,201	40,945	45,971	(5,411)	46,842	46,661	46,470	46,270	163,809

An Equity NPV

Year	*FCFE*	*PV of FCFE*
0	(185,100 BR)	(185,100 BR)
1	34,375 BR	30,840 BR
2	37,201 BR	29,943 BR
3	40,945 BR	29,568 BR
4	45,971 BR	29,784 BR
5	(5,411 BR)	(3,145 BR
6	46,842 BR	24,427 BR
7	46,661 BR	21,830 BR
8	46,470 BR	19,505 BR
9	46,270 BR	17,424 BR
10	163,809 BR	55,342 BR
NPV		70,418 BR

An Equity IRR

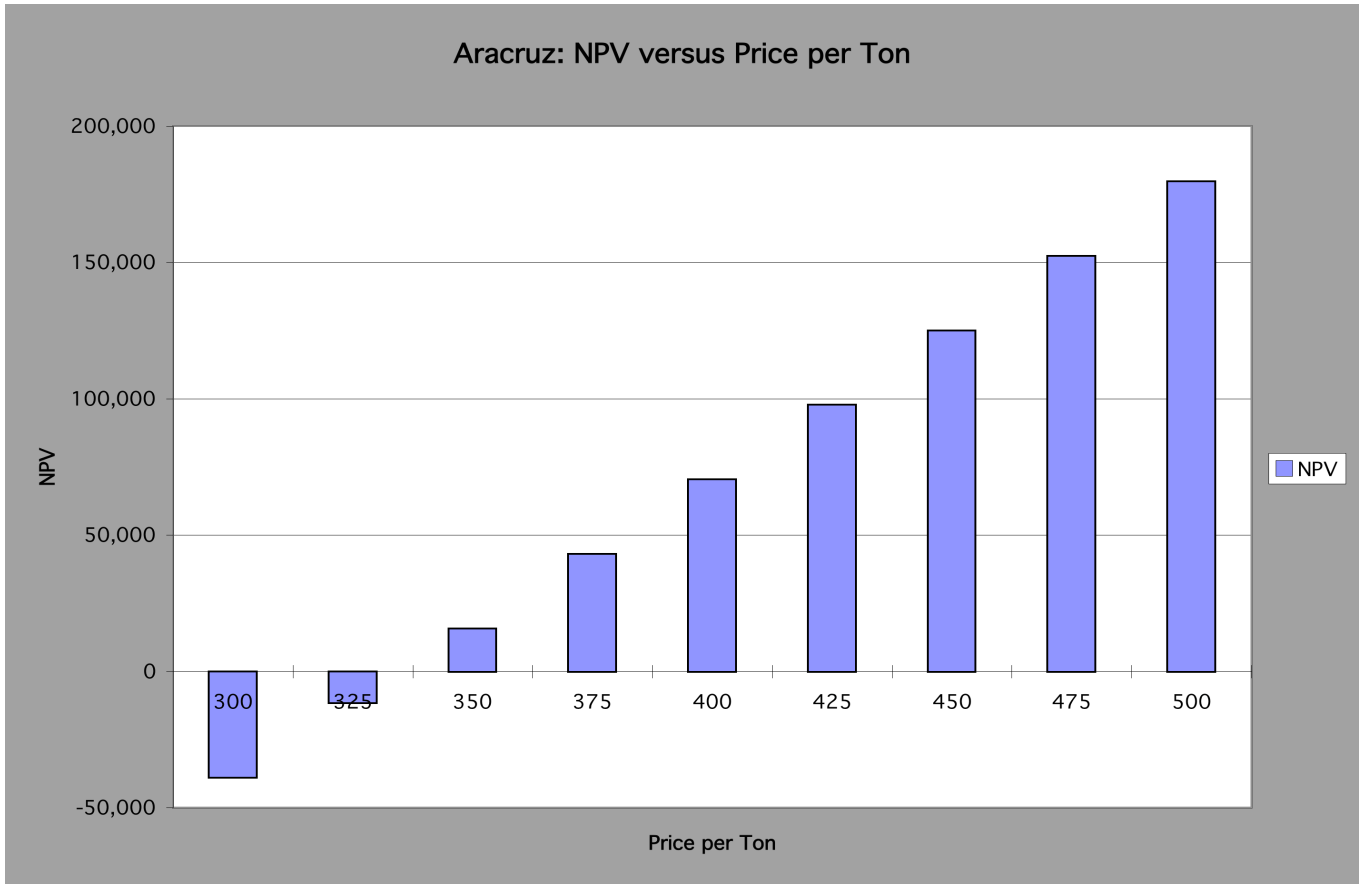
Figure 5.6: NPV Profile on Equity Investment in Paper Plant: Aracruz



The Role of Sensitivity Analysis

- Our conclusions on a project are clearly conditioned on a large number of assumptions about revenues, costs and other variables over very long time periods.
- To the degree that these assumptions are wrong, our conclusions can also be wrong.
- One way to gain confidence in the conclusions is to check to see how sensitive the decision measure (NPV, IRR..) is to changes in key assumptions.

Viability of Paper Plant: Sensitivity to Price per Ton



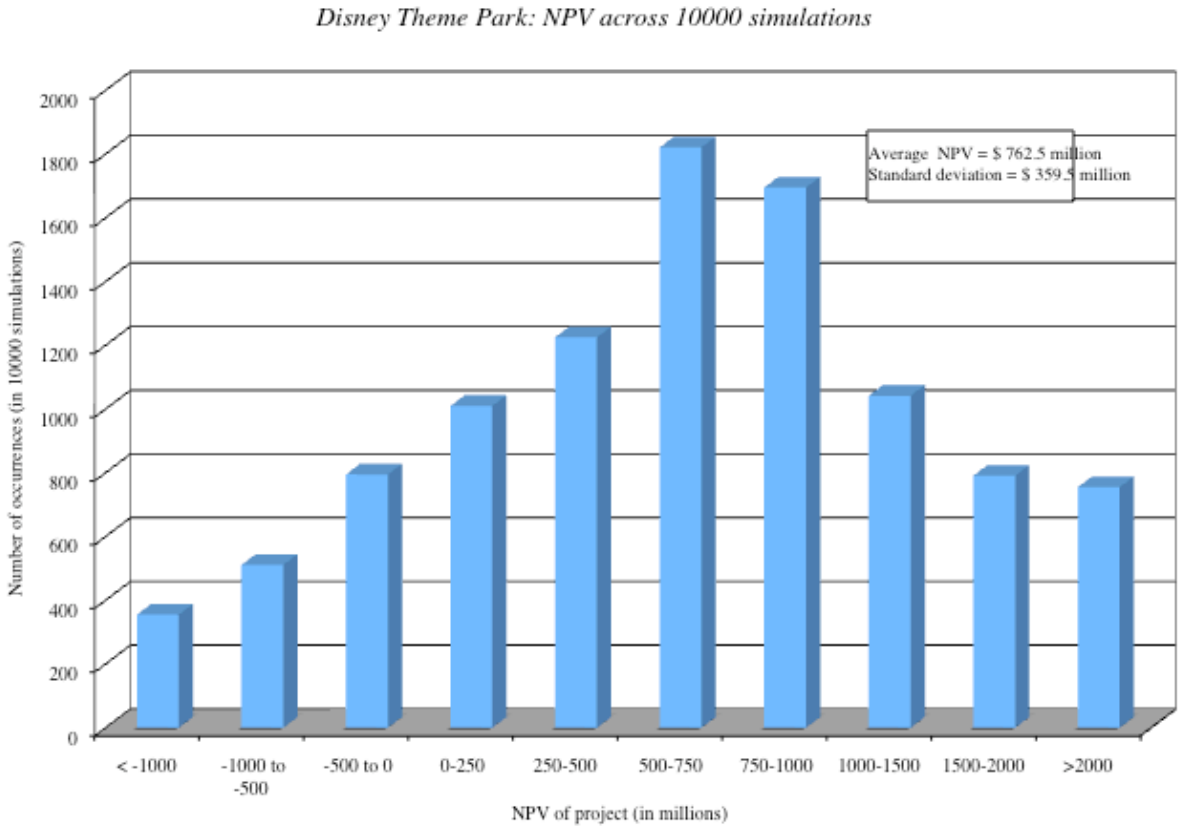
What does sensitivity analysis tell us?

Assume that the manager at Aracruz who has to decide on whether to take this plant is very conservative. She looks at the sensitivity analysis and decides not to take the project because the NPV would turn negative if the price drops below $335 per ton. (Though the expected price per ton is $400, there is a significant probability of the price dropping below $335.)Is this the right thing to do?

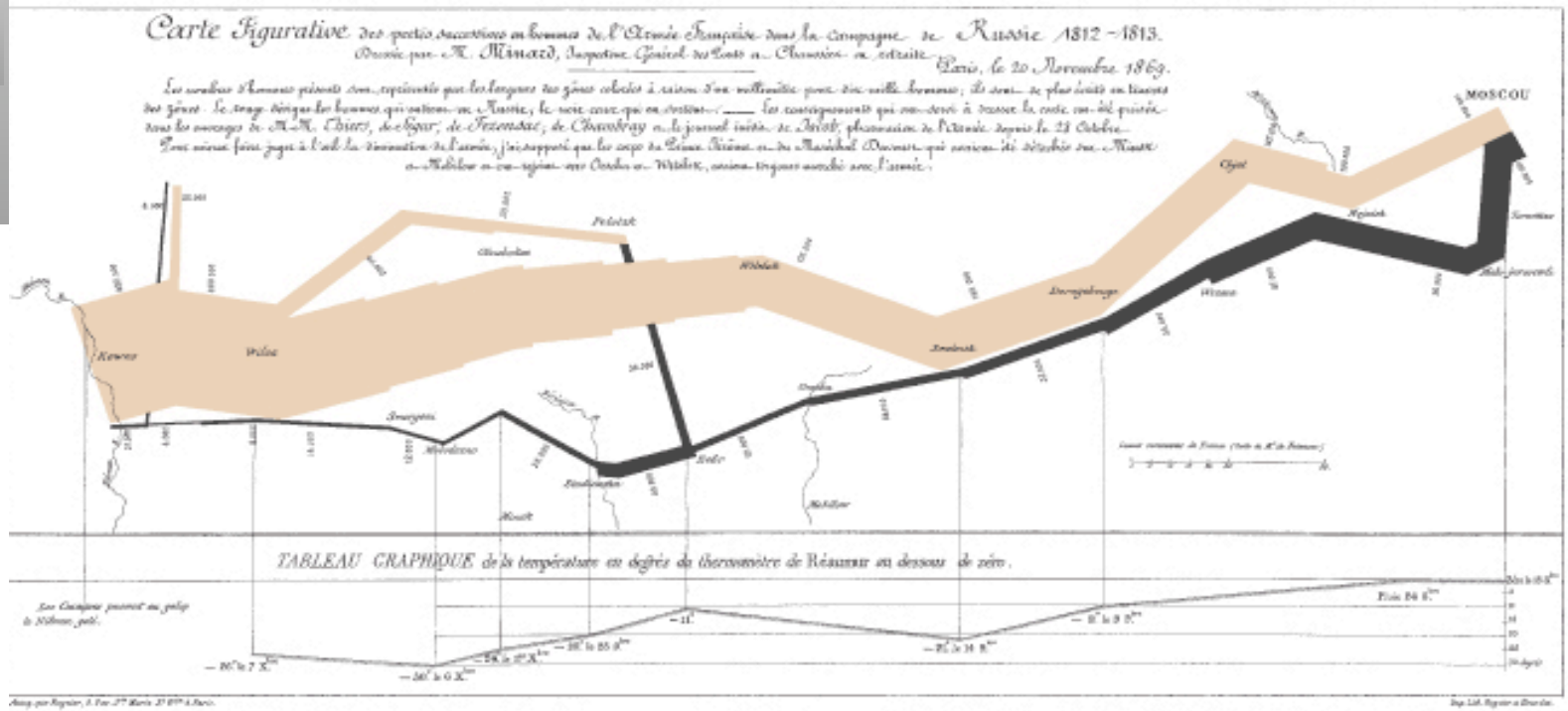
a) Yes
b) No

Explain.

A tool for uncertain times: Simulation
Disney Theme Park Analysis revisited



Make your 'what if" analysis meaningful…



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:
  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: 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 3: 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 uses 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)=		**$ 303,324**	

- 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 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, 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

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

Adding a Café: Bookscape

- The initial cost of remodeling a portion of the store to make it a cafe, and of buying equipment is expected to be $150,000. This investment is expected to have a life of 5 years, during which period it will be depreciated using straight line depreciation. None of the cost is expected to be recoverable at the end of the five years.
- The revenues in the first year are expected to be $ 60,000, growing at 10% a year for the next four years.
- There will be one employee, and the total cost for this employee in year 1 is expected to be $30,000 growing at 5% a year for the next 4 years.
- The cost of the material (food, drinks ..) needed to run the cafe is expected to be 40% of revenues in each of the 5 years.
- An inventory amounting to 5% of the revenues has to be maintained; investments in the inventory are made at the beginning of each year.
- The tax rate for Bookscape as a business is 40% and the cost of capital for Bookscape is 12.14%.

NPV of Café: Stand alone analysis

	0	1	2	3	4	5
Investment	- $ 150,000					
Revenues		$60,000	$66,000	$72,600	$79,860	$87,846
Labor		$30,000	$31,500	$33,075	$34,729	$36,465
Materials		$24,000	$26,400	$29,040	$31,944	$35,138
Depreciation		$30,000	$30,000	$30,000	$30,000	$30,000
Operating Income		-$24,000	-$21,900	-$19,515	-$16,813	-$13,758
Taxes		-$9,600	-$8,760	-$7,806	-$6,725	-$5,503
AT Operating Income		-$14,400	-$13,140	-$11,709	-$10,088	-$8,255
+ Depreciation		$30,000	$30,000	$30,000	$30,000	$30,000
- Δ Working Capital	$3,000	$300	$330	$363	$399	-$4,392
Cash Flow to Firm	-$153,000	$15,300	$16,530	$17,928	$19,513	$26,138
PV at 12.14%	-$153,000	$13,644	$13,146	$12,714	$12,341	$14,742
Net Present Value	-$86,413					

The side benefits

- Assume that 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%.

	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 CF @ 12.14%	$25,861	$25,369	$24,886	$24,412	$23,947
Net Present Value	$124,474				

- The net present value of the added benefits is $124,474. Added to the NPV of the standalone Café of -86,413 yields a net present value of $38,061.

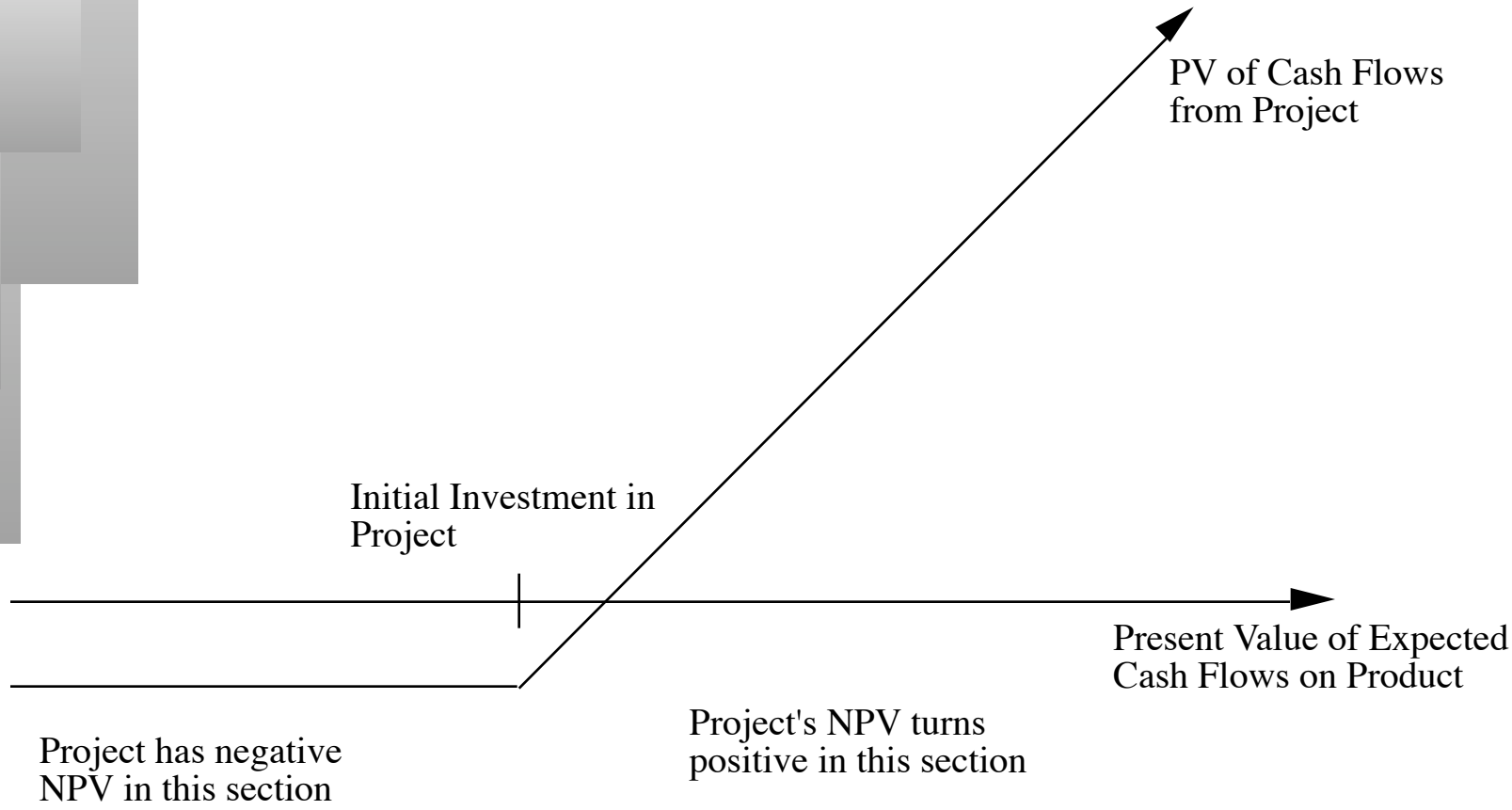
Project Options

- 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



An example: A Pharmaceutical patent

- Assume that a pharmaceutical company has been approached by an entrepreneur who has patented a new drug to treat ulcers. The entrepreneur has obtained FDA approval and has the patent rights for the next 17 years.
- While the drug shows promise, it is still very expensive to manufacture and has a relatively small market. Assume that the initial investment to produce the drug is $ 500 million and the present value of the cash flows from introducing the drug now is only $ 350 million.
- The technology and the market is volatile, and the annualized standard deviation in the present value, estimated from a simulation is 25%.

Valuing the Patent

- Inputs to the option pricing model
  - Value of the Underlying Asset (S) = PV of Cash Flows from Project if introduced now = $ 350 million
  - Strike Price (K) = Initial Investment needed to introduce the product = $ 500 million
  - Variance in Underlying Asset's Value = $(0.25)^2 = 0.0625$
  - Time to expiration = Life of the patent = 17 years
  - Dividend Yield = 1/Life of the patent = 1/17 = 5.88% (Every year you delay, you lose 1 year of protection)
  - Assume that the 17-year riskless rate is 4%. The value of the option can be estimated as follows:
- Call Value= $350\ exp^{(-0.0588)(17)}\ (0.5285) - 500\ (exp^{(-0.04)(17)}\ (0.1219) =$ $ 37.12 million

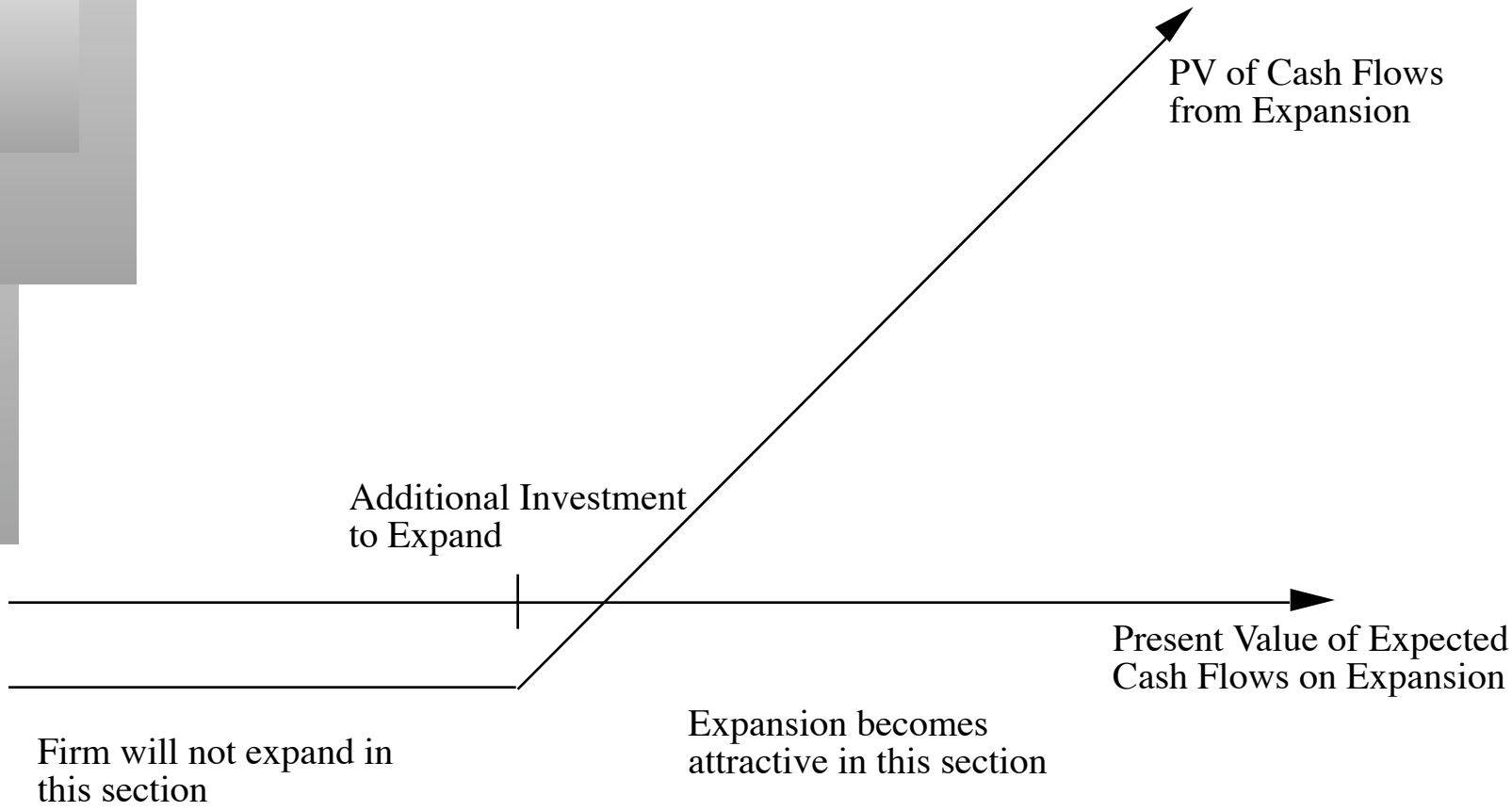
Insights for Investment Analyses

- 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.
- 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 standard deviation in firm value of publicly traded entertainment firms in the Latin American markets, which is approximately 30%.
  - Variance in Underlying Asset's Value = $0.30^2 = 0.09$
- Time to expiration = Period of expansion option = 10 years
- Riskless Rate = 4%

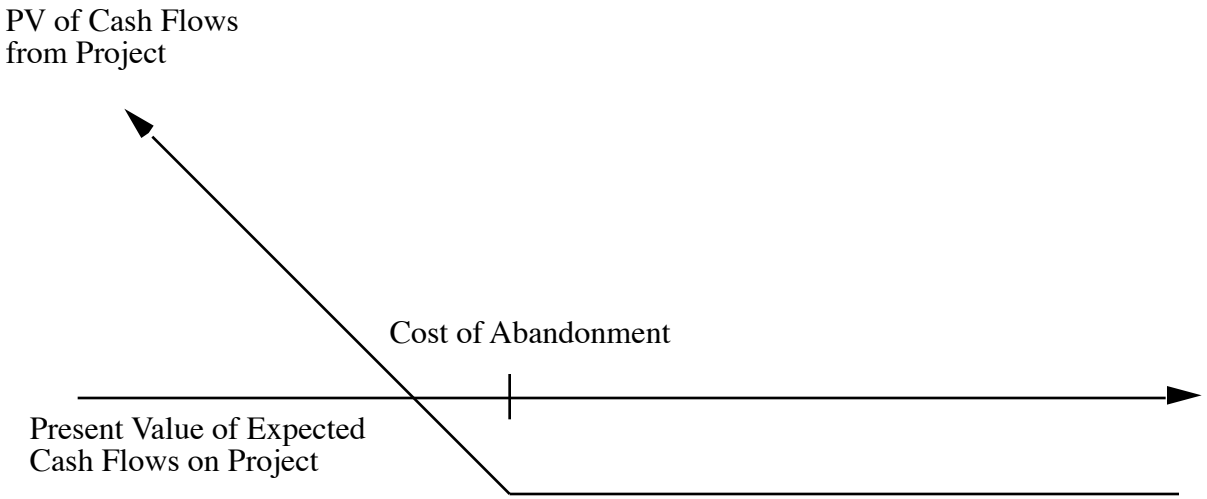
Call Value= $ 36.3 Million

Considering the Project with Expansion Option

- NPV of Disney Channel in Mexico = $ 80 Million - $ 100 Million = - $ 20 Million
- Value of Option to Expand = $ 36.3 Million
- NPV of Project with option to expand
  = - $ 20 million + $ 36.3 million
  = $ 16.3 million
- **Take the first investment, with the option to expand.**

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 $ 255 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 is negative, 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 = Abandonment period =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 4%.

Should Disney take this project?

- Call Value = 254 $\exp^{(0.04)(5)}$ (0.9194) -150 ($\exp^{(-0.04)(5)}$ (0.8300)
  = $ 89.27 million
- Put Value= $ 89.27 - 254 $\exp^{(0.04)(5)}$ +150 ($\exp^{(-0.04)(5)}$ = $ 4.13 million
- The value of this abandonment option has to be added on to the net present value of the project of -$ 1 million, yielding a total net present value with the abandonment option of $ 3.13 million.

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.