A more direct way of getting to incremental cash flows

	0	1	2	3	4	5	6	7	8	9	10
Revenues		\$0	\$1,250	\$1,750	\$2,500	\$3,125	\$3,438	\$3,781	\$4,159	\$4,575	\$4,667
Direct Expenses		\$0	\$788	\$1,103	\$1,575	\$1,969	\$2,166	\$2,382	\$2,620	\$2,882	\$2,940
Incremental Depreciation		\$0	\$375	\$419	\$394	\$322	\$317	\$314	\$314	\$316	\$318
Incremental G&A		\$0	\$63	\$88	\$125	\$156	\$172	\$189	\$208	\$229	\$233
Incremental Operating Income		\$0	\$25	\$141	\$406	\$678	\$783	\$896	\$1,017	\$1,148	\$1,175
- Taxes		\$0	\$9	\$51	\$147	\$245	\$283	\$323	\$367	\$415	\$424
Incremental after-tax Operating income		\$0	\$16	\$90	\$260	\$433	\$500	\$572	\$650	\$734	\$751
+ Incremental Depreciation		\$0	\$375	\$419	\$394	\$322	\$317	\$314	\$314	\$316	\$318
- Capital Expenditures	\$2,000	\$1,000	\$1,188	\$752	\$276	\$258	\$285	\$314	\$330	\$347	\$350
- Change in non-cash Working Capital		\$0	\$63	\$25	\$38	\$31	\$16	\$17	\$19	\$21	\$5
Cashflow to firm	(\$2,000)	(\$1,000)	(\$859)	(\$267)	\$340	\$466	\$516	\$555	\$615	\$681	\$715

Sunk Costs

- What is a sunk cost? 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.
- <u>The sunk cost rule</u>: When analyzing a project, sunk costs should not be considered since they are not incremental.
- A Behavioral Aside: It is a well-established finding in psychological and behavioral research that managers find it almost impossible to ignore sunk costs.

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

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- 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

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- Cash Flow Type
- 1. Simple CF
- 2. Annuity

Discounting Formula $CF_n / (1+r)^n$

Compounding Formula CF₀ (1+r)ⁿ

 $A\left[\frac{(1+r)^{n} - 1}{r}\right]$

3. Growing Annuity



4. Perpetuity

5. Growing Perpetuity

A/r Expected Cashflow next year/(r-g)

Discounted cash flow measures of return

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- 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 makes the net present value equal 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

- Salvage Value: 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 often set equal to book value of fixed assets and working capital
- <u>Terminal Value</u>: 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) =715 (1.02) /(.0846-.02) = \$ 11,275 million

Which yields a NPV of..

Year	Annual Cashflo	Terminal Value	Present Value
0	-\$2,000		-\$2,000
1	-\$1,000		-\$922
2	-\$859		-\$730
3	-\$267		-\$210
4	\$340		\$246
5	\$466		\$311
6	\$516		\$317
7	\$555		\$314
8	\$615		\$321
9	\$681		\$328
10	\$715	\$11,275	\$5,321
			\$3,296

Discounted at Rio Disney cost of capital of 8.46%

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 \$3,296 million.
 - Will the market price increase by the same amount? Why or why not?

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 12.60%. This is greater than the cost of capital of 8.46%.
- 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. They can yield different results, especially why comparing across projects because
 - A project <u>can have only one NPV</u>, whereas it can have more than one IRR.
 - The NPV is a <u>dollar surplus value</u>, whereas the IRR is a <u>percentage measure</u> <u>of return</u>. 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".

Does the currency matter?

- The Rio Disney Theme Park analysis was done in dollars, even though the project will be based in Brazil and will have cash flows primarily in Brazilian Reais.
- Would your assessment of the project have been any different if we had done the analysis in Brazilian Reais?
 - 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 (\$R), the discount rate has to be a dollar (\$R) 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 \$R

- The inflation rates were assumed to be 9% in Brazil and 2% in the United States. The \$R/dollar rate at the time of the analysis was 2.35 \$R/dollar.
- The expected exchange rate was derived assuming purchasing power parity.
 - Expected Exchange Rate_t = Exchange Rate today * (1.09/1.02)^t
- The expected growth rate after year 10 is still expected to be the inflation rate, but it is the 9% \$R inflation rate.
- The cost of capital in \$R was derived from the cost of capital in dollars and the differences in inflation rates:

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

= (1.0846) (1.09/1.02) - 1 = 15.91%

Disney Theme Park: \$R NPV

Expected Exchange = Exchange Rate to	Rate _t day * (1.09/1.02) ^t		Discount at \$R cost of capital = $(1.0846) (1.09/1.02) - 1 = 15$.			
				/		
Year	Cashflow (\$)	\$R/\$	Cashflow (\$R)	Present Value		
0	-R\$ 2,000.00	R\$ 2.35	-R\$ 4,700.00	-R\$ 4,700.00		
1	-R\$ 1,000.00	R\$ 2.51	-R\$ 2,511.27	-R\$ 2,166.62		
2	-R\$ 859.03	R\$ 2.68	-R\$ 2,305.29	-R\$ 1,715.95		
3	-R\$ 267.39	R\$ 2.87	-R\$ 766.82	-R\$ 492.45		
4	R\$ 340.22	R\$ 3.06	R\$ 1,042.63	R\$ 577.68		
5	R\$ 466.33	R\$ 3.27	R\$ 1,527.21	R\$ 730.03		
6	R\$ 516.42	R\$ 3.50	R\$ 1,807.31	R\$ 745.36		
7	R\$ 555.08	R\$ 3.74	R\$ 2,075.89	R\$ 738.63		
8	R\$ 614.95	R\$ 4.00	R\$ 2,457.65	R\$ 754.45		
9	R\$ 681.46	R\$ 4.27	R\$ 2,910.36	R\$ 770.81		
10	R\$ 11,989.85	R\$ 4.56	R\$ 54,719.84	R\$ 12,503.50		
				R\$ 7,745.43		
	NPV =	R\$ 7,745/2.35=	\$ 3,296 Million			
Aswath Damodaran	NPV is	s equal to NPV in				

Uncertainty in Project Analysis: What can we

do?

- Based on our expected cash flows and the estimated cost of capital, the proposed theme park looks like a very good investment for Disney. Which of the following may affect your assessment of value?
 - Revenues may be over estimated (crowds may be smaller and spend less)
 - Actual costs may be higher than estimated costs
 - Tax rates may go up
 - Interest rates may rise
 - Risk premiums and default spreads may increase
 - All of the above
- How would you respond to this uncertainty?
 - Will wait for the uncertainty to be resolved
 - Will not take the investment
 - Ask someone else (consultant, boss, colleague) to make the decision
 - Ignore it.
 - Other

One simplistic solution: See how quickly you can get your money back...

If your biggest fear is losing the billions that you invested in the project, one simple measure that you can compute is the number of years it will take you to get your money back.

	Year	Cash Flow	Cumulated CF	PV of Cash Flow	Cumulated DCF	
	0	-\$2,000	-\$2,000	-\$2,000	-\$2,000	
	1	-\$1,000	-\$3,000	-\$922	-\$2,922	
	2	-\$859	-\$3,859	-\$730	-\$3,652	
	3	-\$267	-\$4,126	-\$210	-\$3,862	
	4	\$340	-\$3,786	\$246	-\$3,616	
Payback = 10.3 years \longrightarrow	5	\$466	-\$3,320	\$311	-\$3,305	
	6	\$516	-\$2,803	\$317	-\$2,988	
	7	\$555	-\$2,248	\$314	-\$2,674	
	8	\$615	-\$1,633	\$321	-\$2,353	
	9	\$681	-\$952	\$328	-\$2,025	
	10	\$715	-\$237	\$317	-\$1,708	
	11	\$729	\$491	\$298	-\$1,409	
	12	\$743	\$1,235	\$280	-\$1,129	
	13	\$758	\$1,993	\$264	-\$865	
	14	\$773	\$2,766	\$248	-\$617	Discounted Payback
	15	\$789	\$3,555	\$233	-\$384	= 16.8 years
Aswath Damodaran	16	\$805	\$4,360	\$219	-\$165	2010 J 011 0
	17	\$821	\$5,181	\$206	\$41	260

A slightly more sophisticated approach: Sensitivity Analysis & What-if Questions...

- The NPV, IRR and accounting returns for an investment will change as we change the values that we use for different variables.
- One way of analyzing uncertainty is to check to see how sensitive the decision measure (NPV, IRR..) is to changes in key assumptions. While this has become easier and easier to do over time, there are caveats that we would offer.
- <u>Caveat 1</u>: When analyzing the effects of changing a variable, we often hold all else constant. In the real world, variables move together.
- <u>Caveat 2</u>: The objective in sensitivity analysis is that we make better decisions, not churn out more tables and numbers.
 - Corollary 1: Less is more. Not everything is worth varying...
 - Corollary 2: A picture is worth a thousand numbers (and tables).

And here is a really good picture...



The final step up: Incorporate probabilistic estimates.. Rather than expected values..



Operating Expenses at Parks as % of Revenues (Base Case = 60%)



Country Risk Premium (Base Case = 3% (Brazil))



The resulting simulation...

Average = \$3.40 billion Median = \$3.28 billion



NPV ranges from -\$1 billion to +\$8.5 billion. NPV is negative 12% of the time.

You are the decision maker...

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- Assume that you are the person at Disney who is given the results of the simulation. The average and median NPV are close to your base case values of \$3.29 billion.
- However, there is a 12% probability that the project could have a negative NPV and that the NPV could be a large negative value? How would you use this information?
 - I would accept the investment and print the results of this simulation and file them away to show that I exercised due diligence.
 - I would reject the investment, because it is too risky (there is a 10% chance that it could be a bad project)
 - Other

A New Show for Disney+

- In 2020, Disney focused much of its attention and spending on Disney +, its subscription-based competitor to Netflix.
- While the initial selling point for Disney+ was the immense content that Disney controlled, it became very clear early on (with the Mandalorian) that to get new subscribers, Disney would have to create new exclusive content.
- Given that Disney could not and did not want to compete with Netflix on sheer volume, it had to compensate by spending more on its new shows, many of which were based off either the Star Wars or Marvel franchises.

A New Marvel TV series

 Assume that Disney is considering a new 8-episode series that will spin off a Marvel character series, and expects each episode to cost \$25 million (Mandalorian cost \$15 million/episode and Wandavision cost \$25 million/episode).

□ It is planning to offer it only to Disney+ subscribers.

- 1. What are the benefits to Disney from adding this series?
- 2. How would you go about estimating whether it is getting these promised benefits?
- 3. Is there a way you can come to a NPV assessment?

Equity Analysis: The Parallels

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- 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