Alternate Definitions of Operating Cash Flow

1. Bottom Up Approach

$$OCF = NI + Depreciation$$

2. Top Down Approach

$$OCF = Sales - Costs - Taxes$$

3. Tax Shield Approach

$$OCF = [(P - VC)Q - FC](1 - T_C) + Depreciation(T_C)$$

Setting a Bid Price

You are bidding on a project that will require the delivery of 40,000 units per year for six years. The variable cost per unit is $12 and the fixed costs are $100,000. The equipment necessary for production will cost $900,000 and will be depreciated over the six years. The equipment can be sold for $75,000 in six years. Inventory necessary for production will be $50,000. The tax rate is 40 percent and the required return is 14 percent. What minimum price should you submit on the bid?

ICO		
Equipment	–$900,000	
NWC	–50,000	
	–$950,000	

Salvage value		
Sales price	$75,000	
Taxes	–30,000	$(BV - MV)T_C = (\$0 - 75{,}000)(.40)$
Aftertax salvage value	$45,000	

t	Cash flow
0	−$950,000
1	OCF
2	OCF
3	OCF
4	OCF
5	OCF
6	OCF + $50,000 + 45,000

Equivalent Annual Cost (EAC)

EAC is used for mutually exclusive projects with unequal lives. The choice of project will not affect sales, buy only costs. Whichever project is used will be used for the indefinite future.

Project

You operate a golf course and are considering whether to purchase gas or electric carts. The cash flows each year are shown below. If the required return is 12 percent, which cart should you choose?

t	Gas	Electric
0	–$3,000	–$3,500
1	–100	–80
2	–100	–80
3	–100	–80
4	–100	–80
5		–80
NPV	–$3,307.73	–$3,788.38

Inflation and Capital Budgeting

Your company is considering a project that will require an investment of $160,000 in equipment and will result in sales of 11,000 units in Year 1 and 10,000 units in Year 2. The current price of the item is $45, the current variable cost is $27, and the current fixed cost per year is $85,000. These costs will increase at the general inflation rate of 6 percent, and the nominal required return on the project is 14 percent. If the tax rate is 40 percent, what is the NPV of the project?

Chapter 9 – Risk Analysis, Real Options, and Capital Budgeting

Scenario Analysis

A company is considering introducing a new mid-priced toaster. It spent $25,000 in developing the new toaster and feels it will sell 20,000 toasters per year at $20 each for five years. If the new toaster is sold, the company feels it will sell 10,000 more units of its cheap toaster at $12 each and 5,000 fewer of its expensive toaster at $35 each. The new toaster will require $150,000 in new equipment, which will be worthless in five years. The fixed costs are $100,000 per year and the variable costs for the new toaster will be $8. The variable costs for the cheap toaster are $7 and the variable costs for the expensive toaster are $15. Additionally, the company will need $20,000 in inventory of the new toaster. The tax rate is 38 percent and the required return is 14 percent. For the new toaster, the company feels the quantity and price are accurate to ±10 percent and the fixed and variable costs are accurate to ± 15 percent. What are the base case, best case, and worst case values? What are the payback period, NPV, and IRR for each scenario?

	Base	Best	Worst
Quantity			
Price			
VC			
FC			

Worst case

	Sales		VC	
New	18,000($18)	$324,000	18,000(-$9.20)	$(165,600)
Cheap	10,000($12)	120,000	10,000(-7.00)	(70,000)
Expensive	-5,000($35)	(175,000)	-5,000(-$15)	75,000
		$269,000		$(160,600)

Base case

	Sales		VC	
New	20,000($20)	$400,000	20,000(-$8)	$(160,000)
Cheap	10,000($12)	120,000	10,000(-7.00)	(70,000)
Expensive	-5,000($35)	(175,000)	-5,000(-$15)	75,000
		$345,000		$(155,000)

Best case

	Sales		VC	
New	22,000($22)	$484,000	22,000($6.80)	$(149,600)
Cheap	10,000($12)	120,000	10,000(-7.00)	(70,000)
Expensive	-5,000($35)	(175,000)	-5,000(-$15)	75,000
		$429,000		$(144,600)

ICO	
Equipment	–$150,000
NWC	–20,000
	–$170,000

	Worst case	Base case	Best case
Sales	$269,000	$345,000	$429,000
VC	160,600	155,000	144,600
FC	115,000	100,000	85,000
Dep	30,000	30,000	30,000
EBT	–$36,600	$60,000	$169,400
Tax	–13,908	22,800	64,372
NI	$(22,692)	$37,200	$105,028
+Dep	30,000	30,000	30,000
OCF	$7,308	$67,200	$135,028
Payback	Never	2.53 years	1.26 years
NPV	–$134,523.67	$71,090.41	$303,949.43
IRR	-24.15%	29.72%	75.15%

Scenario Analysis (Alternate Calculation)

You are evaluating a 7-year project. You have analyzed the industry and determined the following scenarios:

	Pessimistic	*Expected*	*Optimistic*
Market size	180,000	195,000	210,000
Market share	11%	16%	18%
Selling price	$117	$121	$124
Variable costs per year	$64	$62	$60
Fixed costs per year	$850,000	$800,000	$750,000
Equipment	$1,500,000	$1,400,000	$1,300,000

The tax rate is 40 percent and the required return is 10 percent. There is no salvage value for the equipment. What is the NPV for each scenario?

	Pessimistic	Expected	Optimistic
Units per year	19,800	31,200	37,800
Revenue	$2,316,600.00	$3,775,200.00	$4,687,200.00
Variable costs	1,267,200.00	1,934,400.00	2,268,000.00
Fixed costs	850,000.00	800,000.00	750,000.00
Depreciation	214,285.71	200,000.00	185,714.29
EBT	$(14,885.71)	$840,800.00	$1,483,485.71
Tax	(5,954.29)	336,320.00	593,394.29
Net income	$(8,931.43)	$504,480.00	$890,091.43
+Depreciation	214,285.71	200,000.00	185,714.29
OCF	$205,354.29	$704,480.00	$1,075,805.71
NPV	$(500,249.33)	$2,029,703.69	$3,937,472.78

Sensitivity Analysis

A project will generate sales of $400,000 for five years. Variable costs are 30 percent of sales and fixed costs are $50,000. The equipment will cost $500,000 and will be worthless in five years. Net working capital is $50,000, the tax rate is 40 percent, and the required return is 12 percent. How sensitive is the project's NPV to changes in fixed costs?

ICO	
Equipment	–$500,000
NWC	–50,000
	–$550,000

	Base
Sales	$400,000
VC	120,000
FC	50,000
Dep	100,000
EBT	$130,000
Tax	52,000
NI	$78,000
+Dep	100,000
OCF	$178,000
NPV	$120,021.51

Monte Carlo Simulation

Real Options

– Option to expand
– Option to abandon
– Option to wait

Option to Expand

A friend has asked you to help evaluate the opening of a new restaurant. The restaurant will cost $4,000,000 today to open and will provide cash flows of $450,000 per year indefinitely. If the appropriate interest rate is 12 percent, should the restaurant be opened?

After you have evaluated the new restaurant, you realize that if the restaurant is successful, it is likely that your friend would be able to open a similar restaurant on the other side of town in one year. Because of economies of scale and increased knowledge, the second restaurant will cost $3 million to build and will provide the same cash flows of $450,000 per year. If the probability that the first restaurant is successful is 40 percent, how would you evaluate the proposal now?

Option to Abandon

A company is evaluating a project to produce automobile body parts from recycled newspaper. The building necessary for production will cost $20 million, and the equipment will cost $3 million. If the project is successful, the annual cash flows are expected to be $6 million per year. However, if the project is not successful, the cash flows will be $500,000. The probability of success is 20 percent and the required return is 11 percent. What is the NPV of the project?

If the project is not successful, it will be scrapped in one year. At that time, the building could be sold for a cash flow of $19 million. The equipment is specific to the purpose and has no salvage value. What is the NPV of the project now?

Option to Wait (Timing Option)

A mining company is considering opening a previously closed mine. The cost of opening the mine is $1 million and the cash flow from the sale of the raw ore will be $450,000 per year for five years. Since the sale of the ore will be on a contract, the price will be constant for all five years. At that time, the mine will be depleted. If the required return is 14 percent, what is the NPV of the project?

In analyzing the sales price of the ore, the company realized that the ore price could change next year, which would affect the contract price. If the ore price increases, the cash flows will be $575,000 for five years, while a decrease in the ore price will result in a cash flow of $390,000. There is a 60 percent probability of a price increase. Should the company open the mine now, or wait for one year?

Decision Trees

MacBeth Carpet manufacturing is considering a new carpet plant. The company can spend $55 million on a plant that will produce carpet that eliminates damn spots. There is a 60 percent chance the product will be successful, and if so, the present value of the cash flows will be $85 million. If the carpet is not successful, the present value of the cash flows will be $30 million.

Alternatively, the company could build a plant for $28 million to produce traditional carpet. There is a 50 percent probability of success for this line. If this line is successful, the company can invest $16 million next year to expand. The expansion has a 70 percent probability of success. The present value of successful cash flows at time 1 will be $90 million, and an unsuccessful expansion will have a present value of cash flows at time 1 of $51 million. If the company does not expand, the present value of the cash flows will be $41 million.

If this line is not successful, the value of the cash flows today will be $34 million. If the required return is 12 percent, which plant should the company build?

Decision Trees