Chapter 9 – Making Capital Investment Decisions

Introduction

The cash flows that should be included in a capital budgeting analysis are those that will only occur if the project is accepted

These cash flows are called incremental cash flows

The stand-alone principle allows us to analyze each project in isolation from the firm simply by focusing on incremental cash flows

Cash flow estimation is the most important step in the capital budgeting. It is also the most difficult. In large firms, many departments are involved:

Marketing

Engineering

Operations

Accounting

Personnel

Because of its difficulty, forecast errors can be large thus making poor projects can appear to be good and good project appear poor. It does not matter what type of analytical technique is used, if the cash flows contain large errors, poor decisions can be made.

The role of financial staffs in the forecasting process

Coordinating the efforts of the other departments

Ensuring all participants use a consistent set of economic assumptions

Assure there are no biases inherent in the forecast

Too estimate cash flows; we must identify the relevant cash flows. We want to use cash flows not accounting income.

The incremental cash flows, for project evaluation, consist of any and all changes in a firm's future cash flows that are a direct consequence of taking the project.

Sunk Costs

Opportunity Costs

Turning a building we own into a condo complex. The opportunity costs would be the market value of the building.

Externalities or Side effects

Erosion: Opening a new branch for a bank.

Synergy

Shipping and Installation Costs

Changes in Net Working Capital

Normally, a new project will require some investment in new inventory and accounts like that. This increases net working capital and should be considered in the analysis.

Financing Costs

Not considered in cash flows.

Other Issues

When the flows actually occur

After-tax cash flows

A company is considering a new project that will last for five years. The equipment necessary for production will cost $400,000 and will be depreciated on a straight-line basis to a zero salvage value. The project will generate sales of $300,000 per year. Variable costs are 40 percent of sales and fixed costs are $30,000. The project will require an initial investment of $50,000 in net working capital. The tax rate is 30 percent and the required return is 12 percent. What is the payback period, NPV, and IRR?

Initial Investment

Equip:	-400,000
↑ NWC	-50,000
Net Investment (CF_0)	-$450,000

OCF

Sales	$300,000
VC	120,000
FC	30,000
Dep	80,000
EBT	$70,000
Tax	21,000
NI	$49,000

Remember:
OCF = EBIT + Dep - Taxes
OCF = 70,000 + 80,000 – 21,000
OCF = 129,000

Another way:
OCF = NI + Dep
OCF = 49,000 + 80,000
OCF = 129,000

Non-OCF or Terminal Year CF

After-Tax Salvage Value	0
Return of NWC	50,000
Non-OCF	50,000

NPV/IRR Calculation

CF_0	-450,000		
CF_1	129,000	F_1	4
CF_2	129,000 + 50,000 = 179,000	F_2	1

I	12%	
CPT	NPV	$43,387.47
CPT	IRR	15.65%
	Payback	3.49 years

Here is another way to approach this problem. It is called the Tax Shield approach and is used to calculate the OCF.

$OCF = [Sales - Costs](1 - T_C) + Depreciation(T_C)$

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

Initial Investment

Equip:	-400,000
↑ NWC	-50,000
Net Investment (CF_0)	-$450,000

OCF

$OCF = [Sales - Costs](1 - T_C) + Depreciation(T_C)$

$OCF_{1-5} = (300{,}000 - (0.40)(300{,}000) - 30{,}000)(1 - 0.30) + (80{,}000)(0.30)$

$OCF_{1-5} = 129{,}000$

Non-OCF or Terminal Year CF

After-Tax Salvage Value	0
Return of NWC	50,000
Non-OCF	50,000

NPV/IRR Calculation

CF_0	-450,000		
CF_1	129,000	F_1	4
CF_2	129,000 + 50,000 = 179,000	F_2	1

I	12%	
CPT	NPV	$43,387.47
CPT	IRR	15.65%
	Payback	3.49 years

Aunt Sally's Sauces is considering expansion into a new line of all natural tomato sauces. Sally paid $50,000 for a marketing study that determined sales for the product will be $650,000 per year for five years. Equipment will cost $500,000 and will be depreciated on a straight-line manner to zero over the five-year life of the project. The equipment will have a salvage value of $50,000 in five years. Annual fixed costs are projected at $80,000 per year and variable costs are 60 percent of sales. Net working capital in the amount of $75,000 is needed at the beginning of the project. The tax rate is 40 percent and the required return is 15 percent. What is the payback period, NPV, and IRR?

Initial Investment

Equip:

↑ NWC

Net Investment (CF_0)

OCF

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

OCF_{1-5} =

OCF_{1-5} =

Non-OCF or Terminal Year CF

After-Tax Salvage Value	$SV - (SV – BV)T_C$ =
Return of NWC	
Non-OCF	

NPV/IRR Calculation

CF_0			
CF_1		F_1	4
CF_2		F_2	1
I	15%		
CPT	NPV		
CPT	IRR		
	Payback		

Replacement Analysis

A firm is considering an investment in a new machine with a price of $23 million to replace its existing machine. The current machine has a book value of $6 million, and a market value of $10.5 million. The new machine is expected to have a four-year life, and the old machine has four years left in which it can be used. If the firm replaces the old machine with the new machine, it expects to save $5 million in operating costs each year over the next four years. Both machines will have no salvage value in four years. If the firm purchases the new machine, it will also need an investment of $400,000 in net working capital. The required return on the investment is 10 percent, and the tax rate is 40 percent. What is the NPV and IRR of the decision to replace the old machine?

Initial Investment

	Buy new machine	Keep old machine	Incremental analysis
Purchase new machine	–$23,000,000		–$23,000,000
Net working capital	–400,000		–400,000
Sell (buy) old machine		–$10,500,000	10,500,000
Taxes on old machine		1,800,000	–1,800,000
Total	–$23,400,000	–$8,700,000	–$14,700,000

or

New Equip:

Old Equip_{AT}: $SV - (SV - BV)T_C =$

↑ NWC

Net Investment (CF_0)

OCF

	Buy new machine	Keep old machine	Incremental analysis
Operating expense	$5,000,000		$5,000,000
Depreciation	5,750,000	$1,500,000	4,250,000
EBT	–$750,000	–$1,500,000	$750,000
Taxes	–300,000	–600,000	300,000
Net income	–$450,000	–$900,000	$450,000
OCF	$5,300,000	$600,000	$4,700,000

or

$OCF = [\text{Sales} - \text{Costs}](1 - T_C) + \text{Depreciation}(T_C)$

$OCF_{1-4} =$

$OCF_{1-4} =$

Non-OCF or Terminal Year CF

After-Tax Salvage Value	
Return of NWC	
Non-OCF	

NPV/IRR Calculation

Year	Buy new machine Cash flow	Keep old machine Cash flow	Incremental analysis Cash flow
0	–$23,400,000	–$8,700,000	–$14,700,000
1	5,300,000	600,000	4,700,000
2	5,300,000	600,000	4,700,000
3	5,300,000	600,000	4,700,000
4	5,700,000	600,000	5,100,000
NPV	–$6,326,507.75	–$6,798,080.73	$471,572.98
IRR	-3.09%	-37.07%	11.46%

or

CF_0			
CF_1		F_1	3
CF_2		F_2	1
I	10%		
CPT	NPV		
CPT	IRR		

Expansion Project using MACRS Depreciation

A company is considering a new project that will generate sales of $1.6 million, $2 million, $1.9 million, and $1.4 million over the next four years. The variable costs are 30 percent of sales and fixed costs are $400,000. The equipment necessary for the project costs $1.5 million and will be depreciated on a 3-year MACRS schedule. The equipment will be worth $100,000 in four years. The project will require an immediate investment in net working capital of $350,000. The tax rate is 40 percent and the required return is 11 percent. What is the payback period, NPV, and IRR?

Initial Investment

Equipment	Depreciation Calculations		
↑ NWC	Year	Factor	Depreciation
Net Investment (CF_0)	1	0.3333	499,950
	2	0.4444	666,600
	3	0.1482	222,300
	4	0.0741	111,150
		100%	1,500,000

OCF

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

$OCF_1 = (1{,}600{,}000 – (0.30)(1{,}600{,}000) – 400{,}000)(1 – 0.40) + (499{,}950)(0.40) = 631{,}980$

$OCF_2 =$

$OCF_3 =$

$OCF_4 =$

Non-OCF or Terminal Year CF

After-Tax Salvage Value	$SV - (SV – BV)T_C =$
Return of NWC	
Non-OCF	

NPV/IRR Calculation

CF_0			
CF_1		F_1	1
CF_2		F_2	1
CF_3		F_3	1
CF_4		F_4	1
I	11%		
CPT	NPV		
CPT	IRR		

Replacement Project using MACRS Depreciation

Original Machine		**New Machine**	
Purchased 5 years ago		5-year life	
Initial cost	100,000	3-year MACRS depreciation	
Annual depreciation	9,000	Initial cost	150,000
Book Value today	55,000	Cost savings	50,000 per year
Salvage today	65,000	Salvage in 5 years	0
Salvage in 5 years	10,000		

Required return = 10%

Tax rate = 40%

Initial Investment

Equip (New)

Equip $(Old)_{AT}$

Net Investment (CF_0)

OCF

OCF_1 = (0 - (-50,000))(1 – 0.40) + [(0.33)(150,000) – 9,000](0.40) = 46,200

OCF_2 = 30,000 + [(0.45)(150,000) – 9,000](0.40) = 53,400

OCF_3 = 30,000 + [(0.15)(150,000) – 9,000](0.40) = 35,400

OCF_4 = 30,000 + [(0.07)(150,000) – 9,000](0.40) = 30,600

OCF_5 = 30,000 + (– 9,000)(0.40) = 26,400

Non-OCF or Terminal Year CF

SV_{Old} -10,000

Total: -10,000

NPV Calculation

CF_0	-89,000		
CF_1	46,200	F_1	1
CF_2	53,400	F_2	1
CF_3	35,400	F_3	1
CF_4	30,600	F_4	1
CF_5	26,400 – 10,000 = 16,400	F_5	1

I	10%
CPT	NPV
CPT	IRR

Strategic Options

Option to expand

Option to wait

Option to abandon

Strategic options – Sticking our toe in the water