

FIN2010 Financial Management

Lecture 18: Cash flows of a Project II



Review—Incremental Cash Flows

- 3 Principles:
 - Cash flows, not earnings
 - Incremental: the difference between taking and rejecting the project
 - Ignore financing related costs
- Included:
 - Direct change in revenue, costs, CAPEX, depreciation, tax, etc.
 - Indirect changes: opportunity costs, externalities
- Not included:
 - Sunk costs



ICF Calculation

- **Regular cash flows**

Revenue

- COGS
- SGA expenses
- Depreciation
- Interest expenses
- Tax expenses

= Net income

+ Depreciation

- Changes in net working capital
(current asset (**excl. cash**)-current liabilities)

- Capital expenditure

+ changes in financing activities

=net cash flow

- **Incremental cash flows**

Incremental Revenue

- Incremental COGS
- Incremental SGA expenses
- Incremental Depreciation

Remember, we ignore financing related cash flows

- Tax expenses

= Incremental net income (unlevered)

+ Incremental Depreciation

- Incremental changes in net working capital
(**current asset-current liabilities**)

- Incremental capital expenditure

Remember, we ignore financing related cash flows

=net incremental cash flow



HomeNet Example

- Revenue per year: $100,000 \times \$260$, opp cost: $25,000 \times \$100$
- COGS: $100,000 \times \$110$ for HomeNet, $25,000 \times \$60$ for old product
- Overhead: \$2.8M, \$200,000 opportunity costs (not leasing office)
- R&D: \$15M upfront
- CAPEX: \$7.5M, depreciated in 5 years

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales		26000	26000	26000	26000	
-	Cost of goods sold		11000	11000	11000	11000	
=	Gross profit		15000	15000	15000	15000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	10500	10500	10500	10500	(1500)
-	Income Tax at 40%	(6000)	4200	4200	4200	4200	(600)
=	Unlevered Net Income	(9000)	6300	6300	6300	6300	(900)
Free Cash Flow(\$thousands)							
+	Depreciation		1500	1500	1500	1500	1500
-	Capital Expenditures	7500					
-	Change in NWC						
=	Free Cash Flow						

Agenda

- Example-HomeNet
- Discussion of depreciation
- More examples



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Disposal of Capitalized Assets

- When firms sell their capital assets, they may realize a capital gain (loss) and have tax liabilities (savings) accordingly.
 - $\text{Capital gain/loss} = \text{sale price} - \text{book value}$
 - $\text{Book value} = \text{purchase price} - \text{accumulated depreciation}$
- When there is capital gain, firms pay taxes.
 - The after-tax cash flow from the asset sale
 $= \text{sale price} - \text{tax liabilities} = \text{sale price} - (\text{tax rate} * \text{capital gain})$
- When there is capital losses:
 - The after-tax cash flow from the asset sale
 $= \text{sale price} + \text{tax savings} = \text{sale price} + (\text{tax rate} * \text{capital losses})$
- Sale price also called liquidation or salvage value



Example

Assume we estimate that the equipment can be sold for \$20,000 by the end of year 5. What adjustment should we make for the cash flows? Assume the marginal tax rate is 40%.

- Solution:
 - Sale price=\$20,000
 - Book value by the end of year 5= $7,500,000 - 1,500,000 \times 5 = \0
 - Capital gain/loss= $20,000 - 0 = \$20,000$
 - After-tax cash flow from the sale= $20,000 - 20,000 \times 40\% = 12,000$



Example

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$thousands)							
	Sales		26000	26000	26000	26000	
-	Cost of goods sold		11000	11000	11000	11000	
=	Gross profit		15000	15000	15000	15000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	10500	10500	10500	10500	(1500)
-	Income Tax at 40%	(6000)	4200	4200	4200	4200	(600)
=	Unlevered Net Income	(9000)	6300	6300	6300	6300	(900)
Free Cash Flow(\$thousands)							
+	Depreciation		1500	1500	1500	1500	1500
-	Capital Expenditures	7500					
+	Adjustment for salvage value						12
-	Change in NWC						
=	Free Cash Flow						



Net working capital (NWC)

- Most projects will require an investment in net working capital .
- The increase in net working capital is defined as
- Net Working Capital = Current Assets – Current Liability
= Cash + Inventory + Receivables – Payables
- $\Delta NWC_t = NWC_t - NWC_{t-1}$



Incremental NWC due to HomeNet

Suppose HomeNet will not have incremental cash or inventory requirements. However, receivables related to HomeNet are expected to account for 15% of annual sales, and payables are expected to be 15% of cost of goods sold starting from year 1.

- Accounts receivables: $15\% * 26,000,000 = 3,900,000$
- Accounts payables: $15\% * 11,000,000 = 1,650,000$
- Assumptions:
 - During the project life, we reuse the new working capital
 - At the end of project life, we pay off all the accounts payables and collect back all the receivables



Net working capital (NWC)

- Net working capital

	Year	0	1	2	3	4	5
	Cash requirement	--	--	--	--	--	--
+	Inventory	--	--	--	--	--	--
+	Receivables		3900	3900	3900	3900	--
-	Payables		1650	1650	1650	1650	--
=	Net working capital requirement	--	2250	2250	2250	2250	--
	Δ NWC		2100	0	0	0	(2100)

- After adjusting for new working capital

	Year	0	1	2	3	4	5
Incremental Earnings Forecast							
	Sales		26000	26000	26000	26000	
-	Cost of goods sold		11000	11000	11000	11000	
=	Gross profit		15000	15000	15000	15000	
-	Selling, general, and administrative		3000	3000	3000	3000	
-	Research and development	15000					
-	Depreciation		1500	1500	1500	1500	1500
=	EBIT	(15000)	10500	10500	10500	10500	(1500)
-	Income Tax at 40%	(6000)	4200	4200	4200	4200	(600)
=	Unlevered Net Income	(9000)	6300	6300	6300	6300	(900)
Free Cash Flow(\$thousands)							
+	Depreciation		1500	1500	1500	1500	1500
-	Capital Expenditures	7500					
+	Adjustment for salvage value						12
-	Change in NWC		2100	0	0	0	(2100)
=	Free Cash Flow	(16500)	5700	7800	7800	7800	2712

Calculating the NPV

- Assuming HomeNet's cost of capital is 12%

Year	0	1	2	3	4	5
Free cash flow	(16500)	5700	7800	7800	7800	2712
PV of free cash flow @12%	(\$16,500)	\$5,089	\$6,218	\$5,552	\$4,957	\$1,539
NPV	\$6,855					



Agenda

- Example-HomeNet
- Discussion of depreciation
- More examples



Depreciation – Net Effect

- Depreciation is a non-cash expense. However it changes the taxes a firm needs to pay because it enters into the calculation of taxable income

- Remember:

$$\begin{aligned} FCF_t = & (\text{revenues}_t - \text{costs}_t - \text{depreciation}_t) * (1 - \tau_c) \\ & + \text{depreciation}_t - \text{capital expenditure}_t - \Delta NWC_t \end{aligned}$$

- The effect of depreciation on cash flow:

$$- \text{Depreciation} * (1 - \tau_c) + \text{depreciation} = \text{Depreciation} * \text{tax rate}$$

- This is called the depreciation tax shield

- Depreciation tax shield only works when firms have positive EBIT before depreciation.

- Question to think about: do you want to depreciate a fixed asset faster or slower in order to maximize project NPV?

- Generally faster, except when earning < 0



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More examples #1

- We have simplified the example by assuming the revenue and costs are constant over time.
- In the real world, the estimates of these revenues and costs are likely to be much more complicated.
- Typically,
 - Sales will change from year to year.
 - The average selling price will vary over time
 - The average cost per unit will change over time.



More examples #1

- Suppose sales of HomeNets were expected to be 100,000 units in year 1, 125,000 units in year 2 and 3, and 50,000 units in year 4. By contrast, selling, general, and administrative expenses are expected to rise with inflation by 4% per year.

Year	0	1	2	3	4	5
Incremental Earnings Forecast						
Sales		26000	32500	32500	13000	
- Cost of goods sold		11000	13750	13750	5500	
= Gross profit		15000	18750	18750	7500	
- Selling, general, and administrative		3000	3120	3245	3375	
- Research and development	15000					
- Depreciation		2500	3334	1111	556	
= EBIT	(15000)	9500	12296	14394	3570	0
- Income Tax at 40%	(6000)	3800	4919	5758	1428	0
= Unlevered Net Income	(9000)	5700	7378	8637	2142	0
Free Cash Flow(\$thousands)						
+ Depreciation		2500	3334	1111	556	
- Capital Expenditures	7500					
+ Adjustment for salvage value						12
- Change in NWC		2100	0	0	0	(2100)
= Free Cash Flow	(16500)	6100	10712	9747	2698	2112
PV of free cash flow @12%	(\$16,500)	\$5,446	\$8,539	\$6,938	\$1,714	\$1,198
NPV	\$7,336					

125,000*\$260

125,000*\$110



More examples #2- buy new asset

- Basket Wonders (BW) is considering the purchase of a new basket weaving machine. The machine will cost \$50,000 plus \$20,000 for shipping and installation, and the firm uses 4-year straight-line depreciation. Net working capital will rise by \$5,000 at year 0. Lisa Miller forecasts that revenues will increase by \$110,000 for each of the next 4 years and will then be sold (scrapped) for \$10,000 at the end of the fourth year, when the project ends. Costs of good sold will rise by \$70,000 for each of the next four years. BW is in the 40% tax bracket. What are the incremental cash flows from year 0 to year 4?



More examples #2-revenue and costs

	Year	0	1	2	3	4
Incremental Earnings Forecast						
	Sales		110000	110000	110000	110000
-	Cost of goods sold		70000	70000	70000	70000
=	Gross profit		40000	40000	40000	40000
-	Selling, general, and administrative					
-	Research and development					
-	Depreciation					
=	EBIT					
-	Income Tax at 40%					
=	Unlevered Net Income					
Free Cash Flow(\$thousands)						
+	Depreciation					
-	Capital Expenditures					
+	Adjustment for salvage value					
-	Change in NWC					
=	Free Cash Flow					



More examples #2 – CAPEX & Depr.

- Capital expenditure = $50,000 + 20,000 = 70,000$
- Depreciation = $70,000 \times 25\% = \$17,500$ per year

	Year	0	1	2	3	4
Incremental Earnings Forecast (\$thousands)						
	Sales		110000	110000	110000	110000
-	Cost of goods sold		70000	70000	70000	70000
=	Gross profit		40000	40000	40000	40000
-	Selling, general, and administrative		0	0	0	0
-	Research and development					
-	Depreciation		17500	17500	17500	17500
=	EBIT	0	22500	22500	22500	22500
-	Income Tax at 40%	0	9000	9000	9000	9000
=	Unlevered Net Income	0	13500	13500	13500	13500
Free Cash Flow(\$thousands)						
+	Depreciation		17500	17500	17500	17500
-	Capital Expenditures	70000				
+	Adjustment for salvage value					
-	Change in NWC					
=	Free Cash Flow					

More examples #2 - asset disposal

- Cash flow from the asset disposal
- Sale price=\$10,000
- Cumulative depreciation = \$70,000
- Book value=\$70,000-cumulative depreciation=\$0
- Capital gain from the sale=\$10,000-0=\$10,000
- Taxes=\$10,000*40%=4,000
- Cash flow from the asset disposal=\$10,000-4,000=\$6,000



More examples #2—ICF

	Year	0	1	2	3	4
Incremental Earnings Forecast (\$thousands)						
	Sales		110000	110000	110000	110000
-	Cost of goods sold		70000	70000	70000	70000
=	Gross profit		40000	40000	40000	40000
-	Selling, general, and administrative		0	0	0	0
-	Research and development					
-	Depreciation		17500	17500	17500	17500
=	EBIT	0	22500	22500	22500	22500
-	Income Tax at 40%	0	9000	9000	9000	9000
=	Unlevered Net Income	0	13500	13500	13500	13500
Free Cash Flow(\$thousands)						
+	Depreciation		17500	17500	17500	17500
-	Capital Expenditures	70000				
+	Adjustment for salvage value					6000
-	Change in NWC	5000				-5000
=	Free Cash Flow	(75000)	31000	31000	31000	42000

Net working capital will rise by \$5,000.

Asset disposal



More example #3 - an asset replacement project

- Let us assume that previous asset expansion project is actually an asset replacement project. That is the firm buys the new equipment to replace an old equipment. The cost of the old machine was \$30,000 and depreciated using straight-line over five years (\$6,000 per year). The old machine has been used for three years, and it is projected to serve for another four years. If the firm sell the old machine now, the price is expected to be \$6,000. The new machine will not increase revenues (remain at \$110,000) but it decreases production costs by \$10,000 per year. NWC will rise to \$10,000 from \$5,000 in year 0.



More example #3

- Easy to fill in sales, cost of goods sold, changes in NWC.

	Year	0	1	2	3	4
Incremental Earnings Forecast						
	Sales		0	0	0	0
-	Cost of goods sold		(10000)	(10000)	(10000)	(10000)
=	Gross profit		10000	10000	10000	10000
-	Selling, general, and administrative					
-	Research and development					
-	Depreciation		?	?	?	?
=	EBIT					
-	Income Tax at 40%					
=	Unlevered Net Income					
Free Cash Flow(\$thousands)						
+	Depreciation		?	?	?	?
-	Capital Expenditures	?				
+	Adjustment for salvage value	?				?
-	Change in NWC	5000				-5000
=	Free Cash Flow					

- What about incremental depreciation, capital expenditure, salvage value?

More example #3

- The old machine uses five years depreciation. So if we continue to use it, it will have two more years of depreciation.
- If the firm buys new asset, it can sell the current asset for \$6,000.
 - Sale price=\$6,000
 - Book value= $30,000 - 3 \times 6,000 = 12,000$
 - Capital gain/loss= $6,000 - 12,000 = -6,000$
 - Tax saving from the loss= $6,000 \times 40\% = 2,400$
 - Total cash flow from the sale= $6,000 + 2,400 = 8,400$

w/o the asset replacement					
Depreciation		6000	6000	0	0
Capital Expenditures					
Adjustment for salvage value					
w/ the asset replacement					
Depreciation		17500	17500	17500	17500
Capital Expenditures	70000				
Adjustment for salvage value	8400				6000
Incremental depreciation(w/-w/o)		11500	11500	17500	17500
Incremental capital expenditure (w/-w/o)	70000	0	0	0	0
Incremental adjustment for salvage value (w/-w/o)	8400	0	0	0	6000

More example #3—ICF

	Year	0	1	2	3	4
Incremental Earnings Forecast (\$thousands)						
	Sales		0	0	0	0
-	Cost of goods sold		(10000)	(10000)	(10000)	(10000)
=	Gross profit		10000	10000	10000	10000
-	Selling, general, and administrative					
-	Research and development					
-	Depreciation		11500	11500	17500	17500
=	EBIT	0	(1500)	(1500)	(7500)	(7500)
-	Income Tax at 40%		(600)	(600)	(3000)	(3000)
=	Unlevered Net Income		(900)	(900)	(4500)	(4500)
Free Cash Flow(\$thousands)						
+	Depreciation		11500	11500	17500	17500
-	Capital Expenditures	70000				0
+	Adjustment for salvage value	8400				6000
-	Change in NWC	5000				-5000
=	Free Cash Flow	(66600)	10600	10600	13000	24000



Summary

- The after-tax cash flow from the asset sale
$$= \text{sale price} + \text{tax savings} = \text{sale price} + (\text{tax rate} * \text{capital losses})$$
- Net Working Capital = Current Assets – Current Liabilty
$$= \text{Cash} + \text{Inventory} + \text{Receivables} - \text{Payables}$$
- Depreciation tax shield = depreciation * tax rate
 - Only offers tax savings against positive EBIT
- More examples on incremental cash flows



Next Lecture—Project Analysis

- Motivation
- What-If Analysis
 - Sensitivity analysis
 - Scenario analysis
- Break-Even Analysis
 - Accounting break-even
 - Cash break-even
 - Financial break-even
- Managerial Options

