Tax Rates, Taxes, After-Tax Amounts

- Assume that you have to pay tax on a given amount A and that the tax rate is T_c. The tax rate for the Shark Attractant project is $T_c = 21\%$. In real life, computing taxes would be more complicated. It is not uncommon, however, for a big corporation to know what its so-called effective tax rate is, and use that rate as a flat-rate proxy in such calculations.
- We have:

	Abstract	Example
Taxable amount	A	$\$10,000$
Tax rate	T_c	21%
Tax amount	$A \cdot T_c$	$10,000 \cdot 21\% = \$2,100$
After-tax amount	$A - A \cdot T_c = A(1 - T_c)$	$10,000 - 2,100 = \$7,900$

- So, if we want to compute only the after-tax amount, we can use directly the expression $A \cdot (1 - T_c)$.

Taxing Capital Asset Sales

- Assume that an asset has a book value of \$700. We'll assume two scenarios: (a) it is sold for \$3,000, and (b) it is sold for \$500. The tax rate is $T_c = 21\%$.

Book value	\$700	\$700
Sale price	$\$3,000$	$\$500$
Taxable gain/(loss)	$\$2,300$	$-\$200$
Tax	$2,300 \cdot 21\% = \$483$	$-200 \cdot 21\% = -\$42$
After tax cash flow	$3,000 - 483 = \$2,517$	$500 - (-42) = \$542$

- When the sale price is **below the book value of the asset**, we pay, in effect, **negative tax**. In other words, the "tax" boosts our cash flow.
- **Warning**: If the book value of an asset is not 0, then the after tax cash flow **is not simply** $\boldsymbol{(\textit{sale price}) \cdot (1 - T_c)}$**.** The formula that applies in the general case is $\boldsymbol{(\textit{sale price}) - [(\textit{sale price}) - (\textit{book value})] \cdot T_c}$ $\boldsymbol{= (\textit{sale price}) \cdot (1 - T_c) + (\textit{book value}) \cdot T_c}$. It may be easier, however, to just follow the logic as in the table above and not worry about the formula.
- Examples: When the sale price is \$3,000, the after-tax cash flow is: $3,000 \cdot (1 - 0.21) + 700 \cdot 0.21 = \$2,517$. When the sale price is 500, the after-tax cash flow is: $500 \cdot (1 - 0.21) + 700 \cdot 0.21 = \$542$.

Shark Attractant Project

- **Projected** income statement:

Sales (50,000 units @ \$4/unit)	+200,000
Variable costs (\$2.5/unit)	-125,000
Fixed costs	-17,430
Depreciation (\$90,000/3)	-30,000
EBIT	**27,570**
Taxes (@21%)	-5,790
Net income	**21,780**

- $EBIT = (Sales) - (Costs) - (Depreciation)$
  $Taxes = (EBIT) \cdot T_c$, where $T_c = 21\%$ is the tax rate (assumed flat)
  $NI = (EBIT) - (Taxes) = (EBIT) - (EBIT) \cdot T_c = (EBIT) \cdot (1 - T_c)$

OCF - Alternative Definition 1

- Earlier, we defined the Operating Cash Flow (OCF):
  $OCF = (EBIT) + (Depreciation) - (Taxes)$

- From the analysis of the income statement, we have:
  $NI = (EBIT) - (Taxes) = (EBIT) - (EBIT) \cdot T_c = (EBIT) \cdot (1 - T_c)$

- We now have:
  $$OCF = (EBIT) + (Depreciation) - (Taxes)$$
  $$OCF = \underbrace{(EBIT) - (Taxes)}_{=NI} + (Depreciation)$$

- **Thus $OCF = NI + (Depreciation)$.**
  Note that this version of the OCF formula starts at the bottom of the income statement.

OCF - Alternative Definition 2

- Earlier, we defined the Operating Cash Flow (OCF):
  $OCF = (EBIT) + (Depreciation) - (Taxes)$

- From the analysis of the income statement, we have:
  $EBIT = (Sales) - (Costs) - (Depreciation)$

- We now have:
  $OCF = (EBIT) + (Depreciation) - (Taxes)$
  $OCF = [(Sales) - (Costs) - (Depreciation)] + (Depreciation) - (Taxes)]$
  $OCF = (Sales) - (Costs) - (Taxes)$

- **Thus $\boldsymbol{OCF = (Sales) - (Costs) - (Taxes)}$.**
  Note that this version of the OCF formula starts on quantities at the TOP of the income statement.

OCF - Alternative Definition 3

- Remember from earlier that
  $OCF = (EBIT) + (Depreciation) - (Taxes)$ and $Taxes = (EBIT) \cdot T_c$.
- $OCF = (EBIT) + (Depreciation) - (Taxes)$
  $OCF = [(EBIT) - (Taxes)] + (Depreciation)$
  $OCF = (EBIT) \cdot (1 - T_c) + (Depreciation)$
  $OCF = [(Sales) - (Costs) - (Depreciation)] \cdot (1 - T_c) + (Depreciation)$
  $\boldsymbol{OCF = [(Sales) - (Costs)] \cdot (1 - T_c) + (Depreciation) \cdot T_c}$
- If we did not recognize depreciation as a (non-cash) expense, we would pay taxes on the entire operation income (i.e., on sales - costs). But recognizing depreciation boosts our cash flow by the amount $\boldsymbol{(Depreciation) \cdot T_c}$. Depreciation “shields” some of our operating income from taxes.
- We call this amount the value of the tax shield provided by depreciation.

Cost-Cutting Proposals

- New automation equipment will save \$22,000/year (pre-tax). The equipment costs \$80,000, will be depreciated linearly over 5 years. Salvage value after 5 years will be \$20,000.
- We set up a table and we start filling it up:
-

	Year					
	0	1	2	3	4	5
Operating Cash Flow						
Net Change in Working Capital	0	0	0	0	0	0
Capital Spending	-80,000					**15,800**
Total Cash Flow						

- The **after-tax** salvage value in year 5 will be: ((pre-tax salvage value)-(depreciated value))$\times(1\text{-}\mathrm{T}_c)$ $=(20{,}000\text{-}0)\times(1\text{-}0.21)=\$15{,}800$.

Cost-Cutting Proposals (2)

- **Incremental linear** depreciation per year
  $= 80{,}000/5 = \$16{,}000.$
- **Incremental** operating income
  =(incr. sales)-(incr. costs)
  $= 0\text{-}(\text{-}22{,}000) = \$22{,}000.$
- **Incremental** EBIT
  = (incr. operating income) - (incr. depreciation)
  = (incr. sales) - (incr. costs) - (incr. depreciation)
  $= 0\text{-}(\text{-}22{,}000)\text{-}16{,}000 = \$6{,}000.$
- **Incremental** taxes on incremental EBIT
  $= 6{,}000 \times 0.21 = \$1{,}260.$
- **Incremental** operating cash flow
  = (incr. EBIT) - (incr. taxes) + (incr. depreciation)
  $= 6{,}000 - 1{,}260 + 16{,}000 = \$20{,}740.$

Cost-Cutting Proposals (3)

	Year					
	0	1	2	3	4	5
Operating Cash Flow		20,740	20,740	20,740	20,740	20,740
Net Change in Working Capital	0	0	0	0	0	0
Capital Spending	-80,000					15,800
Total Cash Flow	**-80,000**	**20,740**	**20,740**	**20,740**	**20,740**	**36,540**

- Using a 10% discount rate, the NPV of this series of cash flows is $8,431.47, so the project is worth undertaking.