Chapter 17 – After-Tax Economic Analysis

INEN 303
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Terms - continued

- **Operating Expenses (E)**
  - All legally recognized costs associated with doing business for the tax year
  - Real cash flows that are tax deductible for corporations: Wages and salaries, Utilities, etc.

- **Taxable Income**
  - Calculated amount of money for a specified time period from which the tax liability is determined
  - $TI = GI – E – D$

Terms - continued

- **Tax rate (T)**
  - A percentage of $TI$ owed in taxes
  - The applicable tax rate depends upon the total amount of $TI$

- **Taxes owed equals:**
  - $Taxes = (TI)(T)$

- **Net Operating Profit After Tax (NOPAT)**
  - $NOPAT = TI – (TI)(T) = (TI)(1-T)$


<table>
<thead>
<tr>
<th>Bracket</th>
<th>Taxable Income</th>
<th>Brackets</th>
<th>Marginal Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$0</td>
<td>$50,000</td>
<td>0.15</td>
</tr>
<tr>
<td>2</td>
<td>$50,000</td>
<td>$75,000</td>
<td>0.25</td>
</tr>
<tr>
<td>3</td>
<td>$75,000</td>
<td>$100,000</td>
<td>0.34</td>
</tr>
<tr>
<td>4</td>
<td>$100,000</td>
<td>$335,000</td>
<td>0.39</td>
</tr>
<tr>
<td>5</td>
<td>$335,000</td>
<td>$10,000,000</td>
<td>0.34</td>
</tr>
<tr>
<td>6</td>
<td>$10,000,000</td>
<td>$15,000,000</td>
<td>0.35</td>
</tr>
<tr>
<td>7</td>
<td>$15,000,000</td>
<td>$18,333,333</td>
<td>0.38</td>
</tr>
<tr>
<td>8</td>
<td>$18,333,333</td>
<td>Unlimited</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Marginal tax rate is charged. A business with an annual $TI$ of $50,000 has a marginal rate of 15%. However, a business with $TI$ $100,000 pays 15% for the first $50,000, 25% on the next $25,000, and 34% on the remainder.

Effective Tax Rate

- Corporations pay higher rates for larger taxable incomes (graduated tax rate system).
- Each year the IRS reviews and/or alters the TI limits to account for inflation and other factors (indexing).

- **Marginal tax rates**
  - Change with TI ranges, so
  - $T_{avrage} = Taxes/TI$

- **Effective Tax Rate** used in our analysis is also a single number, that accounts for all taxes (includes state tax rate). Calculated as:
  - $T_e = T_{state average} + (1-T_{state average})T_{federal average}$
  - So, Taxes = $(TI)(T_e)$
Basic Tax Equations - Individual

- **Gross Income**
  - GI = salaries + wages + interest and dividends + other income

- **Taxable Income**
  - TI = GI – personal exemptions – standard or itemized deductions

- **Tax**
  - T = (taxable income)(applicable tax rate)

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<table>
<thead>
<tr>
<th>Tax Rate</th>
<th>Taxable Income, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>0.10</td>
<td>0-7,000</td>
</tr>
<tr>
<td>0.15</td>
<td>7,001-28,400</td>
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<tr>
<td>0.25</td>
<td>28,401-68,800</td>
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<tr>
<td>0.28</td>
<td>68,801-143,500</td>
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<tr>
<td>0.33</td>
<td>143,501-311,950</td>
</tr>
<tr>
<td>0.35</td>
<td>Over 311,950</td>
</tr>
</tbody>
</table>

Before-Tax and After-Tax Cash Flow

- **NCF** = cash inflows – cash outflows
- **Cash Flow Before Tax (CFBT)**
  - CFBT = gross income – expenses – initial investment + salvage value = GI – E – P + S
  - Cash Flow After Tax (CFAT)
  - CFAT = CFBT – Taxes = CFBT – (TI)(Te)
  - CFAT = (GI – E – P + S) – (GI – E – D)(Te)
  - Note that depreciation is not a real cash flow, but it has a “positive” effect!

Example 17.3

- A company expects to initiate a new outreach service next year. Small facilities will be constructed in about 35 cities across the continent. Each facility is expected to cost $550,000 initially with a resale (salvage) value of $150,000 after 6 years—the time period for which the company’s Board of Directors approved this activity. MACRS depreciation allows a 5-year recovery period. The company estimates bottom-line results at annual net increases to the corporation of $200,000 in revenue and $90,000 in costs. Using an effective tax rate of 35%, tabulate the CFBT and CFAT estimates.
Effect of Different Depreciation Methods

- Criteria used to compare different depreciation methods
- Given recovery period $n$, choose the depreciation rates that minimize the PW of taxes paid in future
- This is equivalent to maximizing the present worth of depreciation
  \[
  PW_D = \sum_{t=1}^{n} D_t \left( \frac{P}{F, i, t} \right)
  \]

Comparing Depreciation Methods

- Assumptions
  - Effective Tax rate is a constant
  - CFBT exceeds annual depreciation under all methods
  - All depreciation methods reduce BV to S in n years
- Consequences
  - The total taxes paid are equal for all depreciation models
  - The PW of taxes paid is less for accelerated depreciation methods
- Note: For a fixed depreciation method and varying $n$, $PW_{\text{taxes}}$ is less for smaller $n$ values
- See Examples 17.4 and 17.5

Capital Gains (Losses) for Corporations

- Selling price is SP and first cost is P
- For Non-depreciating assets
  - Capital gain (CG) if SP > P
    - CG = SP - P
  - Capital Loss (CL) if SP < P
    - CL = P - SP
- For Depreciating assets
  - Depreciation Recapture (DR) if $BV_t < SP < P$
    - DR = SP - BV_t
  - DR and Capital Gain (CG) if SP > P
    - DR = P - BV_t and CG = SP - P
  - Capital Loss (CL) if SP < BV_t
    - CL = BV_t - SP

Depreciation Recapture and Capital Losses for Corporations
General TI Equation – for Corporations

- The basic TI equation is:
  \[ TI = GI - E - D + CG + DR - CL \]
  - Gross income, Capital gain, Depreciation Recapture
  - Expenses, Depreciation, Capital Loss

After-Tax PW, AW, and ROR Evaluation

- Work with CFAT instead of NCF and after-tax MARR instead of before-tax MARR
- One project
  - Apply PW or AW >= 0 for selection
  - Accept the project if \( \text{after-tax MARR} \leq i^* \)
  - \( i^* \) is the after-tax break-even ROR
- Two or More Projects
  - Select the alternative with the largest PW or AW value
  - Incremental after-tax break-even ROR analysis

An Approximate Relationship

- Before-tax MARR = After-tax MARR/(1-T_e)
- Before-tax ROR = After-tax ROR/(1-T_e)
- Only for non-depreciating assets.

- See Example 17.8

After-Tax Replacement Study

- Similar to before-tax analysis but carried out with CFAT
- After-tax treatment of a replacement problem will generate a different data set than a before-tax replacement analysis
- Could have DR, CG, CL situations
- See Example 17.12 and Table 17-6
- After-tax replacement analysis is more involved
- An after-tax analysis could reverse a before-tax analysis on some problems

After-Tax Value Added Analysis

- Value added is a term to indicate that a product or a service has added value to the consumer or buyer
- To start, apply the equation for Net Operating Profit After Tax:
  - NOPAT = Taxable Income – taxes = (TI)(1-T_e)
- Economic Value Added (EVA) is the amount of NOPAT remaining after removing the cost of invested capital during the year
  - EVA = NPAT – cost of invested capital
    = (TI)(1-T_e) – (after-tax MARR)(BV_{t-1})