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A Note on After-Tax Analysis Where Capitalized Costs are Depreciated

Steven H. Bullard and Thomas J. Straka

Forest management often requires relatively long-term and capital intensive investments. Economic analysis of timber management alternatives can therefore be an extremely important aspect of decision-making. Investment analysis techniques are prominent in forest management texts and have also been the subject of many articles in the forestry literature. Any forestry investment analysis involves several important aspects. Topics included in reports by Gunter and Haney (1984) and Bullard et al. (1986), for example, include the treatment of inflation, income taxes, risk, and the choice of an appropriate discount rate. In this article, we focus on a very specific aspect of after-tax investment analysis—the appropriate, after-tax discount rate where capitalized costs are depreciated. We discuss this aspect in particular because previous forestry texts, reports, and articles have not been explicit in stating that a tax-adjusted discount rate is necessary in such cases.

CAPITALIZED COSTS AND DEPRECIATION

Forest landowners can deduct capitalized operation costs in one of three ways, depending on the type of costs involved. The costs of certain resource-based assets like timber are typically deducted through depletion; the costs of "nonwasting" assets like land are deducted when the asset is sold; and the costs of "wasting" assets like equipment and buildings are generally deducted over time through depreciation (Clutter et al. 1983). Forestry investment analysis often includes depreciation of equipment and structures like buildings, fences, and road improvements. Depreciation is also used, however, when private landowners take advantage of the tax credit and series of deductions allowed for certain reforestation expenses (see Hoover et al. 1989). For landowners that claim a 10% tax credit and deduct 95% of their reforestation costs on eight tax returns, for example, the series of deductions is essentially straight-line depreciation for 7 years. Eight tax returns are involved because only one-half of a full year’s deduction is allowed in the first and eighth years. Deductions reduce income tax liability by lowering taxable income. Where capitalized costs are depreciated, the tax savings are included in investment analyses by discounting the savings to the present with compound interest. Tax liability is estimated by:

\[
\text{(Income tax due)} = \frac{\text{(Marginal tax rate) (Income-deductions)} - \text{Credits}}{1} \tag{1}
\]

Each deduction therefore lowers the tax bill by \((\text{Marginal tax rate}) \times (\text{Depression})\). When a reforestation expense, equipment purchase, or other cost is depreciated, of course, the expense results in a series of deductions, and therefore a series of present and future tax savings—all of which can be discounted to the present:

\[
\sum_{n=0}^{d} \left[ \frac{\text{(Marginal tax rate)} \times (\text{Depression}_n)}{(1 + i)^n} \right] \tag{2}
\]

Where \(i\) is the discount rate, \(n\) is the year in which a depreciation deduction occurs due to a specific initial ex-

1 Edited but nonrefereed contributions from our readers describing useful ideas, shortcuts and findings for the field forester.

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Table 1. After-tax present value of reforestation costs. Landowners who qualify for reforestation tax incentives receive a credit and eight separate deductions. A landowner who spends $10,000 on reforestation, who claims a 10% tax credit, and who deducts 95% of the expense on the next 8 tax returns, has the following tax savings (tax rate = 0.28, before-tax discount rate = 10%).

<table>
<thead>
<tr>
<th>Year</th>
<th>Item</th>
<th>Tax savings</th>
<th>Present value, before-tax discount rate = 10%</th>
<th>Present value, tax-adjusted discount rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(1/14)(9500)(.28)</td>
<td>$1,000</td>
<td>$1,000.00</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>0</td>
<td>(1/7)(9500)(.28)</td>
<td>190</td>
<td>190.00</td>
<td>190.00</td>
</tr>
<tr>
<td>1</td>
<td>(1/7)(9500)(.28)</td>
<td>380</td>
<td>345.45</td>
<td>354.48</td>
</tr>
<tr>
<td>2</td>
<td>(1/7)(9500)(.28)</td>
<td>380</td>
<td>314.05</td>
<td>330.67</td>
</tr>
<tr>
<td>3</td>
<td>(1/7)(9500)(.28)</td>
<td>380</td>
<td>265.50</td>
<td>287.74</td>
</tr>
<tr>
<td>4</td>
<td>(1/7)(9500)(.28)</td>
<td>380</td>
<td>259.55</td>
<td>268.42</td>
</tr>
<tr>
<td>5</td>
<td>(1/7)(9500)(.28)</td>
<td>380</td>
<td>235.95</td>
<td>248.42</td>
</tr>
<tr>
<td>6</td>
<td>(1/7)(9500)(.28)</td>
<td>380</td>
<td>214.50</td>
<td>225.39</td>
</tr>
<tr>
<td>7</td>
<td>(1/7)(9500)(.28)</td>
<td>190</td>
<td>97.50</td>
<td>116.79</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>$2,942.50\text{a}</td>
<td>$3,106.95\text{b}</td>
</tr>
</tbody>
</table>

\(\text{a}\) Effective cost = $10,000 - 2,942.50 = $7,057.50.
\(\text{b}\) Effective cost = $10,000 - 3,106.95 = $6,893.05.

\(s\) is the percentage of costs paid by a federal or state program.