Overview of Lecture 9

Taxes
- The Tax Code
- Calculating after-tax cash flows
- What Discount Rate to Use?

Materials covered:
- Reader, Lecture 7
- BM Chapter 6, pp. 121-134.
Review: Internal Rate of Return (IRR)

- IRR is the most popular alternative to NPV.
- It is intuitive and usually gives the right result.
- A project’s IRR is defined as the interest rate that sets the NPV of cash flows equal to zero. Given $C_0, C_1, \ldots, C_t$ the IRR is the $r$ solving the equation:

$$0 = C_0 + \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \ldots$$
The U.S. Tax Code

- In valuing a project or firm, we need to know its cash flows.
- Only **after-tax** cash flows can be distributed to shareholders.
- We need to understand the basics of how taxes are calculated, and how this affects
  - A project’s cash flows.
  - The appropriate discount rate that firms should use.
A company purchases a car for $25,000. Because a car is a depreciable asset, the company cannot deduct the $25,000 immediately.

- The government specifies a “tax life” for the asset.
- The cost of the car is “written off” as a depreciation expense each year during the tax life.

Warning: Depreciation is not a cash flow.

What are the cash flows associated with buying the car?

- Initial capital expenditure (outflow)
- Tax shields in future years due to depreciation (inflow)
  » Tax shield = depreciation x tax rate
Under this rule the firm deducts a depreciation expense equal to

\[
\frac{\text{Purchase Price}}{\text{Tax Life}}
\]

from its income every year during the asset’s tax life.

In our example, suppose tax life is 5 years.

Annual depreciation = \(25,000/5=5,000\) per year.

For tax purposes, rather than straight line depreciation, companies typically use the IRS’s **Modified Accelerated Cost Recovery Schedule (MACRS)**.

- See BM pp. 130 – 131, Table 6.4.
Deductible vs. Non-deductible Operating Expenses

- **Tax deductible current operating expense:** Any expenditure that is deductible in the period it is incurred.
  - Salaries
  - Rent

- **Non-deductible current operating expense:** Any expenditure which is not deductible, and does not result in a depreciation allowance.
  - Entertainment/meals are only partially deductible
A company produces light bulbs and earns $50,000 a year in sales. To do so it spends $20,000 a year on salaries, $1,000 a year on meals to entertain clients. In addition it purchases a new delivery truck every 4 years. Each new truck costs $50,000, and each old truck can be traded in for $30,000.
Example, continued

- Assume that the truck has a 5 year life, and is depreciated on a straight line basis.
- Assume that in year 9 the truck is sold for $45,000.
- What are the firm’s cash flows if it lasts for 9 years, and the tax rate is 30%?
- To answer the question we need to set up a spreadsheet that tracks all of the cash flows.
# Non-Tax Cash Flows

<table>
<thead>
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<td>50</td>
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<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
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<td>-1</td>
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<td>29</td>
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<td>29</td>
<td>29</td>
<td>29</td>
<td>9</td>
<td>74</td>
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</table>

The -20 for the truck in years 4 and 8 equals +30,000 for the trade in, and -50,000 for the purchase of a new truck.
The truck is a depreciable asset that generates a tax deduction (depreciation expense) of $10,000 per year.

Note that in years 4 and 8 when the truck is sold it has a “book value” of $50,000 \(- 4(\text{Depreciation Per Year}) = $10,000$

The government considers the difference between this and the sale price of $30,000 to be taxable income of $20,000.

– Gain on sale of property, plant and equipment
Calculating taxes

In year 9, the truck has a book value of $40,000, and sells for $45,000, producing additional taxable income of $5,000.

While salaries are fully deductible, only 50% of the meals can be deducted. The total deduction is therefore $20,000 + .5(1,000) = 20,500.
## Calculating Taxes

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<td>5.85</td>
<td>11.85</td>
<td>7.35</td>
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To calculate free cash flow, subtract tax payment from pre-tax cash flow:

<table>
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<td>-2.85</td>
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</table>
The rule: In deciding on the discount rate, think from the perspective of the firm’s investors.

Example: A firm pays a $10 dividend per year forever.

Investors pay 25% tax on their dividend income.

In the financial markets investors can purchase a risk equivalent alternative taxable investment.

- Pretax return is 8% per year
- Investors pay 40% tax on these earnings.

What is the stock worth?
What Discount Rate to Use?

- The discount rate reflects the return available to investors on an equivalently risky alternative investment.
- Since investors only keep what’s left over after paying taxes, we care about their after-tax returns.
- Investors earn 8% but keep only 60% of this, i.e. \(0.6 \times 0.08 = 4.8\%\) after tax.
- This is the appropriate discount rate.
After taxes the investors keep 75\% of the dividend.
- So they get \( .75 \times 10 = \$7.50 \) per year.

To calculate the stock’s value, discount the after-tax cash flows using the after-tax discount rate.

The stock’s value equals
\[
7.5 / .048 = \$156.25.
\]