Capital Structure With Corporate Income Taxes

We now graft corporate income taxes into our concept of corporations.

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Perfect Markets

NA

Recall:

IMPORTANT: **M&M teach us that we must look for where the distortions are in the real world if we want to know which capital structure is best.**
M&M do not teach us that there are no distortions.

- In perfect markets, financial policy is irrelevant. Payouts are split into debt and equity.
- With corporate income taxes, the firm's cash flows are now split into three pieces, debt, equity and taxes.
- As before, we cannot change the size of the whole pizza by changing the firm's capital structure. However, if we can shrink the slice taken by the government, we can increase the total size of the remaining slices. If altering a firm's debt to equity mix lowers taxes, the firm is better off.

IMPORTANT:

The main concepts are:

- **Think in after-tax terms, for both expected cash flows and your investors' opportunity cost of capital.**
  Whether the firm makes $200 and pays the IRS $50, or whether the firm earns a tax-exempt $150 is irrelevant.
- **Think about joint tax avoidance (next chapter).**

Imperfect Markets

Q1: Which form of financing is preferable, if debt and equity are treated symmetrically? I.e.,

- payments to creditors and shareholders is deducted from profits.
- shareholders and creditors pay equal taxes on receipts.

Q2: Which form of financing is preferable, if debt and equity are not treated symmetrically? I.e.,

- payments to creditors but not to shareholders can be deducted from profits.
- shareholders and creditors pay equal taxes on receipts.

Q3: Which form of financing is preferable, if debt and equity are not treated symmetrically? I.e.,

- payments to creditors but not to shareholders can be deducted from profits.
- **shareholders pay lower taxes than creditors on receipts.**

Q4: From a corporate tax perspective, is it better to call payouts to owners “Interest” or “Dividends”?

Real-World Tax Recap

- Taxes and the tax code change often.
- Taxes are different across types of income (capital gains vs. dividends vs. interest income).
- Personal taxes (not used in this chapter; feel free to assume 0%):
  - Ordinary income taxes are high: 40%.
  - Taxes are different across different types of investors or accounts (401K is tax-exempt; so is the Red Cross).
- Any Countereffect? What happens if you have too much debt?
  - The IRS does not play along.
  - Financial distress and bankruptcy costs increase.
  - Other debt advantages and disadvantages appear (e.g. ex-post expropriation, under-investment, free cash flow discipline). These are the subject of Chapter 19.
  - In private firms, the remaining equity holder may be poorly diversified.
  - Equity may not be so easy to shelter from *all* taxes at the personal level.
  - In real life: there are costs to debt tax-sheltering. Capital gains cannot be delayed forever

  These will all influence the costs of capital for both debt and equity.

Capital Structure With Corporate Income Taxes

Think of yourself as both the full debt and full equity holder. (This assumption makes absolutely no difference—as the owner, you can sell the debt off at the appropriate fair price; but the one-owner-of-all-securities scenario makes it easier to think of this.) For now, also assume there are **no personal income taxes**.

No Debt

Investment Cost	$200
Operating Income (before tax)	$80
Interest	$0
Income before tax	+$80
Corporate Income Taxes To Pay (Paid) at 30%	$24
Corporate Income, Post-Tax	$56
You get	
Uncle Sam gets	

(PS: Note that you will receive $80 plus your original $200 (untaxed) capital.)

Q5: What is the PV of what you get, if the opportunity cost of capital (applicable to post-income tax earnings) is 12%?

With HUMONGOUS Debt or the ability to just call the full payout to be "interest payments," even though this is not possible with any sort of interest rate that the IRS would not contest.

Investment Cost	\$200
Operating Income (before tax)	\$80
Interest	\$80
Income before tax	+\$0
Corporate Income Taxes To Pay (Paid) at 30%	\$0
Corporate Income Post-Tax	\$0
You get	
Uncle Sam gets	

Q6: What is the PV of what you get, if the opportunity cost of capital (applicable to post-income tax earnings) is 12%?

With Normal Debt (Issue Bond worth \$139.16 [this will work out to about 60% of the value of the firm, though we do not know firm value yet] at an interest rate of 9%, which comes to $0.09 \cdot \$139.16 \approx \$12.52$ interest payment next year.)

Investment Cost	$200
Operating Income (before tax)	$80
Interest	
Income before tax	
Corporate Income Taxes @ 30%	
Corporate Income Post-Tax	
You get	
Uncle Sam gets	

Q7: What is the PV if the cost of capital is 12%?

You went from (100% equity financed) to (debt/equity ratio of 60%), so your tax shelter *post-discounting (today's value)* is .

Q8: What are the ingredients into a formula for the tax shelter?

Q9: What is the formula for the tax shelter?

This metho is called the **Flow-To-Equity** method. It simply works out a "pro-forma" and reads off the tax payments and residual owner

cash.

APV

APV: Assume the average cost of capital is $\mathcal{E}(\tilde{r}_{\mathsf{FM}})$=12%. This is the *firm*'s opportunity cost of capital, before it takes into account its internal advantage of tax-deductibility.

$$\begin{aligned}
\mathsf{APV} &= \frac{\mathcal{E}(C)}{[1+\mathcal{E}(\tilde{r}_{\mathsf{FM}})]} + \frac{\tau\cdot\mathcal{E}(\tilde{r}_{\mathsf{DT}})\cdot\mathsf{DT}}{[1+\mathcal{E}(\tilde{r}_{\mathsf{FM}})]} \\
\mathsf{APV} &= \frac{\$256}{1+12\%} + \frac{30\%\cdot 9\%\cdot\$139.16}{1+12\%} \\
\mathsf{APV} &= \$228.57 + \$3.36 \approx \$231.93
\end{aligned}$$

Notes:

- $256 is the after-tax expected cash flows.
- We punt on a variety of issues. First, I punt on the appropriate cost of capital for the tax shield. (The book appendix elaborates on better ways.) Here, I just used $\mathcal{E}(\tilde{r}_{\mathsf{FM}})$, and later I may use something else. (Important: I am punting on the cost of capital for the debt-related tax shield in the denominator, not on the interest payments to the debt in the numerator!) Also I am punting on distinguishing clearly promised vs. expected interest payments that result in a tax deduction.

  The extra precision is not worth the complication.

  I believe it would mostly give you "pseudo-precision"—the appearance of more accuracy (or "scientifism") without really adding more accuracy. Section 17-Appendix discusses these complications. Suitable costs of capital would have to take into account the firm's debt pattern over time. Added precision from deeper insights is likely swamped by issues such as the debt policy over time, discount rate uncertainty, and cash flow uncertainty. Spend your time there!

- APV is very convenient if you think of a firm with a constant *amount* of debt over time.

WACC

We will now show

- APV adds back the tax shelter.
- WACC instead reduces the effective cost of capital.
- WACC is convenient if you think of a firm with a constant *ratio* of debt over time.

1. The basic APV equation (APV $\equiv$ PV):

$$\mathsf{APV} \;=\; \mathsf{PV} \;=\; \frac{\$256}{1+12\%} \;+\; \frac{\overbrace{30\% \cdot \overbrace{(9\% \cdot \$139.156)}^{\$12.52}}^{=\$3.7572}}{1+12\%} \;=\; \$231.92$$

$$\mathsf{PV} \;=\; \frac{\mathcal{E}(C)}{1+\mathcal{E}(\tilde{r}_{\mathsf{FM}})} \;+\; \frac{\tau \cdot (\mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot \mathsf{DT})}{1+\mathcal{E}(\tilde{r}_{\mathsf{FM}})} \quad .$$

2. Multiply by $1 + \mathcal{E}(\tilde{r}_{\mathsf{FM}}) \;=\; 1 + 12\%$,

$$(1+12\%) \cdot \$231.92 \;=\; \$256 \;+\; 30\% \cdot (9\% \cdot \$139.156)$$

$$(1+\mathcal{E}(\tilde{r}_{\mathsf{FM}})) \cdot \mathsf{PV} \;=\; \mathcal{E}(C) \;+\; \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot \mathsf{DT} \quad .$$

3. Move the second term over to the other side,

$$(1+12\%) \cdot \$231.92 \;-\; 30\% \cdot (9\% \cdot \$139.156) \;=\; \$256$$

$$(1+\mathcal{E}(\tilde{r}_{\mathsf{FM}})) \cdot \mathsf{PV} \;-\; \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot \mathsf{DT} \;=\; \mathcal{E}(C) \quad .$$

4. Pull out PV, which means divide both terms by it and move it to the outside

$$\left[1 + 12\% - \underbrace{30\% \cdot 9\% \cdot (\$139.156/\$231.92)}_{=1.62\%}\right] \cdot \$231.92 = \$256$$

$$[\quad (1 + \mathcal{E}(\tilde{r}_{\mathsf{FM}})) - \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot (\mathsf{DT}/\mathsf{PV}) \quad] \cdot \mathsf{PV} = \mathcal{E}(C) \ .$$

5. Now notice what DT/PV really is: .

$$\left[1 + 12\% - \underbrace{30\% \cdot 9\% \cdot (60\%)}_{1.62\%}\right] \cdot \$231.92 = \$256$$

$$[1 + \mathcal{E}(\tilde{r}_{\mathsf{FM}}) - \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot (w_{\mathsf{DT}})] \cdot \mathsf{PV} = \mathcal{E}(C)$$

6. Move over the messy expression

$$\$231.92 = \frac{\$256}{\left[1+12\%-\underbrace{30\% \cdot 9\% \cdot (60\%)}_{\text{“reduction” = } 1.62\%}\right]}$$

$$\mathsf{PV} = \frac{\mathcal{E}(C)}{\left[1+\underbrace{\mathcal{E}(\tilde{r}_{\mathsf{FM}}) - \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot (w_{\mathsf{DT}})}_{\text{tax-adjusted WACC}}\right]}$$

We could be done here!! We will just rewrite this slightly to express the tax-adjusted WACC in terms of its components.

- SIDENOTE: The cost of capital for the firm is 12%. The cost of capital for the debt is 9%. Use MM from an investor perspective to find the appropriate expected rate of return for the equity. This solves into $\mathcal{E}(\tilde{r}_{\mathsf{EQ}}) = 16.5\%$, because

$$\begin{aligned} 12\% &= 40\% \cdot 16.5\% + 60\% \cdot 9\% \\ \mathcal{E}(\tilde{r}_{\mathsf{FM}}) &= w_{\mathsf{EQ}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{EQ}}) + w_{\mathsf{DT}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \quad , \end{aligned}$$

  You should not earn a different rate of return if you purchase both debt and equity than if purchase the firm.

- Replace $\mathcal{E}(\tilde{r}_{\mathsf{FM}}) = 12\%$ with its components,

$$\begin{aligned} & [1 + 12\% \qquad - 1.62\%] \\ = \quad & \mathcal{E}(\tilde{r}_{\mathsf{FM}}) \qquad - \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot (w_{\mathsf{DT}}) \\ = \quad & [1 + \ (40\% \cdot 16.5\% + 60\% \cdot 9\%) \qquad - 30\% \cdot 9\% \cdot 60\%] \\ = \quad & [1 + \ (w_{\mathsf{EQ}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{EQ}}) + w_{\mathsf{DT}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}})) \qquad - \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot w_{\mathsf{DT}}] \\ = \quad & [1 + 40\% \cdot 16.5\% + 1 \cdot 60\% \cdot 9\% - 30\% \cdot 9\% \cdot 60\%] \\ = \quad & [1 + w_{\mathsf{EQ}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{EQ}}) + 1 \cdot w_{\mathsf{DT}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) - \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot w_{\mathsf{DT}}] \end{aligned}$$

- ...and pull out $w_{\mathsf{DT}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}})$,

$$\begin{aligned} & [1 + 12\% \qquad - 1.62\%] \\ = \quad & \mathcal{E}(\tilde{r}_{\mathsf{FM}}) \qquad - \tau \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot (w_{\mathsf{DT}}) \\ = \quad & \{1 + [40\% \cdot 16.5\% + 60\% \cdot 9\% \cdot (1 - 30\%)]\} \\ = \quad & \{1 + [w_{\mathsf{EQ}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{EQ}}) + w_{\mathsf{DT}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot (1 - \tau)]\} \quad . \end{aligned}$$

7. Now substitute this back to the full PV formula,

$$\begin{aligned}
\mathsf{PV} &= \frac{\$256}{1+\underbrace{\left[40\% \cdot 16.5\% + 60\% \cdot 9\% \cdot (1-30\%)\right]}_{=10.38\%}} \\
&= \frac{\$256}{1+10.38\%} \\
&= \$231.92
\end{aligned}$$

$$\mathsf{PV} = \frac{\mathcal{E}(C)}{1+\underbrace{\left[w_{\mathsf{EQ}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{EQ}}) + w_{\mathsf{DT}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot (1-\tau)\right]}_{\text{Tax-Adjusted WACC}}} .$$

In sum:

$$\mathsf{PV} = \frac{\mathcal{E}(C)}{1+[w_{\mathsf{EQ}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{EQ}}) + w_{\mathsf{DT}} \cdot \mathcal{E}(\tilde{r}_{\mathsf{DT}}) \cdot (1-\tau)]}.$$

		WACC
	Cash Flow Used	Cost of Capital Used
A Perfect World	\$280	$\tau = 0$: 12%
An Imperfect World	\$256	$\tau = 30\%$: 10.38%

Note how the case where the corporate tax-rate is zero is a special case of this equation! (No one uses non-tax-adjusted WACC in the real world.)

Pro-Forma Method ("Flow-To-Equity")

- In a pro forma, you subtract out interest first, then taxes. You thereby do exactly what WACC or APV are supposed to do.
- Doing financials also makes it easy to learn the tax subsidy of debt that individual companies earn.
- A big uncertainty of course remains your estimate of the appropriate cost of capital of the firm if you change the debt-ratio of the firm.

Investment Cost	\$200
Operating Income (before tax)	\$80
Interest	\$12.52
Income before tax	+\$67.48
Corporate Income Taxes To Pay (Paid) at 30%	\$20.24
Corporate Income Post-Tax	\$47.23
Total Owner Distributions	\$59.75

Thus, the firm value is

$$\frac{\$259.75}{1+12\%} = \$231.92$$

You would *absolutely not* discount the \$259.75 by the WACC of 10.38%, or add to this \$231.92 the \$3.36 in APV tax shield.

Compute the Tax Shield for Coca-Cola.

Note that "Taxes Payable" vs. "Deferred Taxes" tell us something about actual tax payments. If a firm has $100 in taxes payable, and $100 increase in deferred taxes payable, they paid no actual taxes.

	Income Statement	December 2001	2000	1999
=	Revenues	20,092	19,889	19,284
	COGS	6,044	6,204	6,009
	+ SG&A (incl. Depreciation)	8,696	8,551	8,480
	+ Other Expenses	0	1,443	813
–	= **Total Operating Expenses**	14,740	16,198	15,302
=	**Operating Income**	5,352	3,691	3,982
	+ Other Net Income	607	155	174
=	**EBIT**	5,959	3,846	4,156
+	Interest Expense	289	447	337
=	**Income Before Tax**	5,670	3,399	3,819
–	Income Tax	1,691	1,222	1,388
=	**Income After Tax**	3,979	2,177	2,431
–	Extraordinary Items	-10,000	0	0
=	**Net Income**	3,969	2,177	2,431

Generic

Q10: How would Coca-Cola's tax shelter change if it added another $1 billion in tax?

Q11: Why don't they?

APV **vs.** WACC **vs. Flow-To-Equity**

IMPORTANT: All three methods have the same goal.

APV and WACC compute project value, but they use different adjustment methods. Both start with as-if-fully-taxed cash flows!! The results should be roughly the same.

Flow-To-Equity is entirely different.

Step 1 (APV, WACC) Value the project, assuming it to be all equity financed. I.e., calculate the cash flows that would have occurred if the project were all equity financed (cash flow to equity holders plus after-tax interest).

Step 2 if APV: Add the present value of all current and future tax shields.

Step 2 if WACC: Discount using the WACC, defacto lowering the effective cost of capital on debt, instead of $\tilde{r}_{\mathsf{FM}}$.

PS: My personal preference is often APV or Flow-To-Equity.

IMPORTANT:

- **WACC and APV add a tax subsidy of debt to a hypothetically fully equity-financed and fully-taxed firm.**
- **Never use WACC or APV on current cash flows. Use either only on fully-equity-financed-and-after-taxed cash flows only.**

It follows that tax-adjusted-WACC or APV should not be used with a pro-forma that assumes any debt, which means it has interest payments subtracted off.

Big Mistake To Avoid

17-6

- Don't use current cash flows in WACC or APV.
- You must use "as-if-fully-equity-financed" cash flows here.

Important Quick Tax Rule

17-6B

Q12: If we lever up by \$1 billion *for one year*, how much are we saving?

Q13: If we lever up by \$1 billion *forever*, how much are we saving?

Separation of Investing and Financing Decisions

17-6.C

In the M&M world, you could worry separately about which projects you should take (they determined the PV), and how you would finance them (it did not matter to the value).

Q14: Are investment and financing decisions still separate in a world with corporate taxes?

Other Tax Shelters

17-6.D

- NOLs
- Leasing
- Transfer pricing across countries
- Headquarter location—Is Dell a U.S. company?

OMITTED

Appendix: Exact discount factor for APV tax liability.

Homework Assignment

1. Reread Chapter 17.
2. Read Chapter 18.
3. Hand in all Chapter 17 end-of-chapter problems, due in 7 days.