Capital Structure: With Corporate Income Taxes

(Welch, Chapter 18)

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Did you bring your calculator? Did you read these notes and the chapter ahead of time?

Is it true that M&M teaches us that managers in the real world do not care about capital structure?

Is it true that M&M teaches us that capital structure in the real world does not have value consequences? ... or ... M&M is stupid. Why study capital structure if it makes no difference?

WTH? Does anything matter if even capital structure does not matter? Next, you will tell us that even P/E doesn't matter?!?

Do debt and equity really own the firm?

Do investors care about before-tax or after-tax income?

($200 in income taxed at 50%, vs. $100 in income taxed at 0%)?

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

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

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.

Tax Code

- Taxes and the tax code change often.
- Taxes are different across types of income (ordinary income vs. capital gains vs. dividends vs. interest income).
- Personal and corporate taxes:
  - Ordinary income taxes are high: 35-40% + state.
  - Taxes are different across different types of investors or accounts (401K is tax-exempt; so is the Red Cross. A firm with NOLs may have almost no tax obligations. Most firms do have such obligations.)
- Any countereffects? What happens if a firm has too much debt and thus does not pay any income tax?
  - Cliff-hanger—this will be covered later. For now, assume there are none. In real life:
  - 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). See Chapter 19.
  - In private firms, the equity holder may be poorly diversified.
  - Equity may or may not easily shelter **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.

Do corporations pay taxes? Does a house pay taxes?

Thought Experiment

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 single-owner scenario makes it easier to think conceptually.) For now, also assume that you face **no personal income taxes** (or other market imperfections).

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

How much will you and Uncle Sam get in taxes from the corporation **next** year?

As the holder of all debt and equity, what is the value of your claims if the firm issued bonds worth \$139.16 today at an interest rate of 9% (which comes to $9\% \cdot \$139.16 \approx \$12.52$ interest payments next year). What is the PV of the firm to you (at 12% discount rate)?

Check: What is the debt-to-capital ratio of this firm?

Compared to 100% equity financing, how much tax-shelter are you getting from a debt/equity ratio of 60% (after time-discounting)?

If you start with fully-taxed value, what are the ingredients into a formula for the additional tax-shelter value? Then, what is the formula?

If you start with the as-if-equity-financed-and-fully-taxed cash flows of \$228.57 today (and contemplated a leverage restructuring), what (APV) formula would you use to compute the value if you go to a 60/40 debt-capital refinanced value?

In APV, what exactly is the first-term cash flow that is then adjusted up? Is it the current-capital-structure cash flow?

Why does the tax shield have a cost of capital of R_{FM}?

We punt on a variety of issues. First, we punt on the appropriate cost of capital for the tax shield. (The book appendix elaborates on better ways.) Here, we just used $E(R_{FM})$, and later we may use something else. (Important: we are 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! The latter one is what matters.) Also, we are punting on distinguishing clearly promised vs. expected interest payments that result in a tax deduction. If the firm has a good chance of death, the preservation of tax NOLs may matter.

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. The chapter 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!

WACC

- Like APV, WACC starts with the fully-taxed as-if-100%-equity value.
- 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. APV is convenient if you think of a firm with a constant **amount** of debt over time

WACC (Derivation Pg1)

- The basic APV equation (APV $\equiv$ PV):

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

$$\text{PV} = \frac{\text{E(CF)}}{[1+\text{E}(\text{R}_{\text{FM}})]} + \frac{\tau \cdot (\text{E}(\text{R}_{\text{DT}}) \cdot \text{DT})}{[1+\text{E}(\text{R}_{\text{FM}})]}.$$

- Multiply by $1+\text{E}(\text{R}_{\text{FM}}) = 1+12\%$,

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

$$(1+\text{E}(\text{R}_{\text{FM}})) \cdot \text{PV} = \text{E(CF)} + \tau \cdot \text{E}(\text{R}_{\text{DT}}) \cdot \text{DT}.$$

- Move the second term over to the other side,

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

$$[1+\text{E}(\text{R}_{\text{FM}})] \cdot \text{PV} - \tau \cdot \text{E}(\text{R}_{\text{DT}}) \cdot \text{DT} = \text{E(CF)}.$$

WACC (Derivation Pg2)

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

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

$$[\quad [1 + E(R_{FM})] - \tau \cdot E(R_{DT}) \cdot (DT/PV) \quad] \cdot PV = E(CF).$$

- Now notice that DT/PV really is a weight:

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

$$[1 + E(R_{FM}) - \tau \cdot E(R_{DT}) \cdot (w_{DT})] \cdot PV = E(CF)$$

WACC (Derivation Pg3)

- Move over the messy expression

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

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

We could be done here!! We will just rewrite this slightly to express the tax-adjusted WACC in terms of its components—that is, not in terms of FM, but in terms of DT and EQ.

WACC (Derivation Pg4)

- Replace $E(R_{FM}) = 12\%$ with its components,

$$\begin{array}{rr} 1+12\% & -1.62\% \\ = E(R_{FM}) & -\tau \cdot E(R_{DT}) \cdot (w_{DT}) \end{array}$$

$$\begin{array}{rr} = 1 + (40\% \cdot 16.5\% + 60\% \cdot 9\%) & -30\% \cdot 9\% \cdot 60\% \\ = 1 + (w_{EQ} \cdot E(R_{EQ}) + w_{DT} \cdot E(R_{DT})) & -\tau \cdot E(R_{DT}) \cdot w_{DT} \end{array}$$

$$\begin{array}{c} = 1 + 40\% \cdot 16.5\% + 1 \cdot 60\% \cdot 9\% - 30\% \cdot 9\% \cdot 60\% \\ = 1 + w_{EQ} \cdot E(R_{EQ}) + 1 \cdot w_{DT} \cdot E(R_{DT}) - \tau \cdot E(R_{DT}) \cdot w_{DT} \end{array}$$

- ...and pull out $w_{DT} \cdot E(R_{DT})$,

$$\begin{array}{rr} 1+12\% & -1.62\% \\ = E(R_{FM}) & -\tau \cdot E(R_{DT}) \cdot (w_{DT}) \end{array}$$

$$\begin{array}{c} = 1 + [40\% \cdot 16.5\% + 60\% \cdot 9\% \cdot (1 - 30\%)] \\ = 1 + \left[w_{EQ} \cdot E(R_{EQ}) + w_{DT} \cdot E(R_{DT}) \cdot (1 - \tau) \right]. \end{array}$$

WACC (Derivation Pg5)

- Now substitute this back to the full PV formula,

$$\text{PV} = \frac{\$256}{1 + \underbrace{[40\% \cdot 16.5\% + 60\% \cdot 9\% \cdot (1 - 30\%)]}_{=10.38\%}} = \frac{\$256}{1 + 10.38\%} = \$231.92$$

In sum:

$$\text{PV} = \frac{\text{E(CF)}}{1 + \left[\text{w}_{\text{EQ}} \cdot \text{E}(\text{R}_{\text{EQ}}) + \text{w}_{\text{DT}} \cdot \text{E}(\text{R}_{\text{DT}}) \cdot (1 - \tau)\right]}.$$

Method		Cash Flow Used	Tax. Cost of Cap	Value
A Perfect World	WACC	*$280*	$\tau = 0$*: 12%*	n/a
An Imperfect World	Flow	$280-$20.24	12%	$259.8/1.12
An Imperfect World	WACC	$256	$\tau = 30\%$: 10.38%	$256/1.1038
An Imperfect World	APV	$256 + $3.76	$\tau = 30\%$: 12%	$259.8/1.12

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.)

Comparison: Pro-Forma (Flow-To-Equity) Method

- 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

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

Warnings

- Never discount the \$259.75 by the tax-adjusted WACC of 10.38%.
- Never add to the \$259.75 the tax-shelter of \$3.36, as in the APV calculation.
- Never use current cash flows in WACC or APV, unless you happen to be 100% equity-financed. Instead, use a cash flow of \$256 for WACC and APV.

Comparison

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 R_{FM}.

PS: My personal preference is often Flow-To-Equity, then APV, then WACC—but all three serve a purpose:

- 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.

If you lever up by \$1 billion **for one year**, roughly how much are you saving?

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

Why don't firms lever up to the wazoo?

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

Other Corporate Income Tax Shelters

- NOLs
- Leasing
- Transfer pricing across countries — most of Google's assets are in Ireland, where they were developed. (Right!?)
- Headquarter location—Is Dell a U.S. company?

Omitted Appendix: Exact discount factor for APV tax liability.

It is not clear whether debt is still so meaningful a shelter. There are better ones.

Adding Personal Taxes

We now add personal income taxes.

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.**

Tax Code Recap

- Capital gains are effectively taxed at lower rates.
  - The statutory tax rate is lower. (The Bush tax cuts have almost eliminated this "double taxation.")
  - Capital gains taxation occurs only at realization, not in the interim. (Still in effect.)
  - Can be offset with capital losses. Still in effect.
  - Are stepped up "for free" at death.
  - May be moved to foreign locales.
- Interest receipts are taxed at ordinary income tax rate (unless they are from tax-exempt munis, which corporations cannot issue).

(It's pretty similar for firms, although it is easier for firms to deduct interest payments.)

What is the effect of personal income taxes on making debt relatively more desirable than equity or vice-versa?

Thought Experiment

- As a family, you own the economy. The less Uncle Sam gets, the more you get.
- Your corporate economy is owned by the family consists of two firms:
  - One firm is a cash cow, low-growth, producing tons of profits, and in the high corporate income tax bracket: 30%.
  - One fast-growing firm (or firm with large tax credits), and in the low corporate income tax bracket: 0%.
- Your family economy consists of two parties:
  - Yourself — an individual taxed at the highest personal income tax rate: 40%. "Retail."
  - Your spouse — a tax-exempt individual "stands in" for tax-exempt institutions and pension vehicles.

  (Assume that capital gains are taxed at around 10%.)
- For either type of firm, you can choose the method of payout.
- For both investors, you can determine which firm you should hold.
- Play Sim City! (Or Heinlein's puppet-master!)

Say: Corp Inc=30%. Personal Inc=40%. Capital Gains=10%. Who should own what?

Crap! There is no puppet master. How would such holding coincidences ever happen in the real world?

Prices!

For example, assume risk-neutrality. Equilibrium may see expected rates of return of 10% on taxable corporate interest, and an 8% expected return from capital gains. Thus,

- Taxable retail investors prefer the 8% capital gains from retail firms.
- Tax-exempt investors prefer the 10% rate of return from cash cows.
- Cash cow firms can deduct the interest payments, so they do not mind paying 10% (effectively, after-tax $10\% \cdot (1-\tau)$), rather than 8%.
- Growth firms prefer to pay the 8% lower cost of capital.

Note—this abstracts away from the fact that these are discounts/premia relative to risk-adjusted rates, not relative to absolute rates.

Markets are darn good moving resources to their best use, where best here means cutting out Uncle Sam.

What calibrates the movement of tax-exempt investors towards Treasury bonds and the movement of tax-exempt investors towards muni bonds?

Write down the WACC formula with taxes *from memory*!

How do you (the corporate manager doing capital budgeting) adjust the WACC or APV formulas not only for your own corporate income taxes, but also for your investors' personal taxes?