

Capital Structure II



Finance Theory II (15.402) – Spring 2003 – Dirk Jenter

The Big Picture: Part I - Financing

A. Identifying Funding Needs

- Feb 6 Case: Wilson Lumber 1
- Feb 11 Case: Wilson Lumber 2

B. Optimal Capital Structure: The Basics

- Feb 13 Lecture: Capital Structure 1
- Feb 20 Lecture: Capital Structure 2
- Feb 25 Case: UST Inc.
- Feb 27 Case: Massey Ferguson

C. Optimal Capital Structure: Information and Agency

- Mar 4 Lecture: Capital Structure 3
- Mar 6 Case: MCI Communications
- Mar 11 Financing Review
- Mar 13 Case: Intel Corporation



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Using M-M Sensibly

- M-M is not a literal statement about the real world. It obviously leaves important things out.
- But it gets you to ask the right question: How is this financing move going to change the size of the pie?
- M-M exposes some popular fallacies such as the “WACC fallacy”.



WACC Fallacy: “Debt is Better Because Debt Is Cheaper Than Equity.”

- Because (for essentially all firms) debt is safer than equity, investors demand a lower return for holding debt than for holding equity. (True)
- The difference is significant: 6% vs. 13% expected return!
- So, companies should always finance themselves with debt because they have to give away less returns to investors, i.e., debt is cheaper. (False)
- What is wrong with this argument?



WACC Fallacy (cont.)

- This reasoning ignores the “hidden” cost of debt:
Raising more debt makes existing equity more risky!

Note: Unrelated to default risk, i.e., true even if debt is risk-free.

- Milk analogy: Whole milk = Cream + Skimmed milk
- People often confuse the two meanings of “cheap”:
 - Low cost
 - Good deal



Practical Implications of MM

- When evaluating a decision (e.g., the effect of a merger):
 - Separate financial (RHS) and real (LHS) parts of the move
 - MM tells that most value is created on LHS
- When evaluating an argument in favor of a financial decision:
 - Understand that it is wrong under MM assumptions
 - What departures from MM assumptions does it rely upon?
 - If none, then this is very dubious argument.
 - If some, try to assess their magnitude.



What's Missing from the Simple M-M Story?

- Taxes:
 - Corporate taxes
 - Personal taxes
- Costs of Financial Distress
- No transaction costs for issuing debt or equity
- No asymmetric information about the firm's investments
- Capital structure does not influence managers' investment decisions



Capital Structure and Corporate Taxes

- Financial policy matters because it affects a firm's tax bill.
- Different financial transactions are taxed differently.
- For a corporation:
 - Interest payments are considered a business expense, and are tax exempt for the firm.
 - Dividends and retained earnings are taxed.



Debt Tax Shield

Claim: Debt increases firm value by reducing the tax burden.

Example: XYZ Inc. generates a safe \$100M annual perpetuity.
Assume risk-free rate of 10%. Compare:

- 100% debt: perpetual \$100M interest
- 100% equity: perpetual \$100M dividend or capital gains

	100% Debt	100% Equity
Income before tax	Interest Income \$100M	Equity income \$100M
Corporate tax rate 35%	0	-\$35M
Income after tax	\$100M	\$65M
Firm value	\$1,000M	\$650M



Intuition

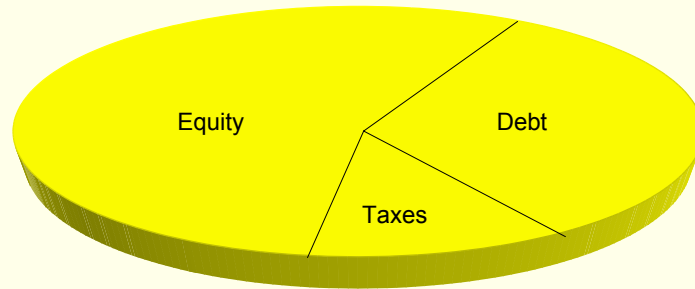
- MM still holds: The pie is unaffected by capital structure.

Size of the pie = Value of *before-tax* cashflows

- But the IRS gets a slice too
- Financial policy affects the size of that slice.
- Interest payments being tax deductible, the PV of the IRS' slice can be reduced by using debt rather than equity.



“Pie” Theory II



Tax savings of debt

Marginal tax rate = t

Taxes for unlevered firm..... $t * \text{EBIT}$

Taxes for levered firm..... $t * (\text{EBIT} - \text{interest})$

Interest tax shield..... $t * \text{interest}$

Interest = $r_d * D$

Interest tax shield (each year) = $t * r_d * D$

If debt is a perpetuity:

(Discount rate for tax shields = r_d)

$$PV(\text{interest tax shields}) = \frac{\text{tax shields per year}}{\text{interest rate}} = \frac{t r_d D}{r_d} = t D$$



MM with Corporate Taxes

- The contribution of debt to firm value is the tax shield's PV:

$$V(\text{with debt}) = V(\text{all equity}) + PV[\text{tax shield}]$$

- Often, we will use:

$$PV[\text{tax shield}] = t \cdot D$$

where:

→ t = corporate tax rate

→ D = (an estimate of) the market value of the firm's debt



Is This Important or Negligible?

- Firm A has no debt and is worth $V(\text{all equity})$.
- Suppose Firm A undertakes a leveraged recapitalization:
 - issues debt worth D ,
 - and buys back equity with the proceeds.

- Its new value is:

$$\frac{V(\text{with debt})}{V(\text{all equity})} = 1 + t \cdot \frac{D}{V(\text{all equity})}$$

- Thus, with corporate tax rate $t = 35\%$:
 - for $D = 20\%$, firm value increases by about 7%.
 - for $D = 50\%$, it increases by about 17.5%.



Bottom Line

- Tax shield of debt matters, potentially quite a bit.
- Pie theory gets you to ask the right question: *How does a financing choice affect the IRS' bite of the corporate pie?*
- It is standard to use t*D for the capitalization of debt's tax break.
- **Caveats:**
 - Not all firms face full marginal tax rate. Definitely not OK for non taxpaying companies.
 - Personal taxes



Tax-Loss Carry Forwards (TLCF)

- Many firms with TLCF continue to make losses and fail to take advantage of the debt tax shield.
- TLCF can be carried backward/forward for 3/5 years.
 - If paid taxes in the last three years, TLCF can be used to get a refund.
 - If cannot return to profitability in five years, TLCF expire unutilized.
 - Even if eventually utilized, need to incorporate time value of money.
- Bottom line: More TLCF → Less Debt



Personal Taxes

- Investors' return from debt and equity are taxed differently
- **Classical Tax Systems** (e.g., US):
 - Interest and dividends are taxed as ordinary income.
 - Capital gains are taxed at a lower rate.
 - Capital gains can be deferred (contrary to dividends and interest)
 - Corporations have a 70% dividend exclusion
- **Imputation Systems** (e.g., most of Europe)
 - Tax credit for recipients of dividends (= fraction of corporate tax on profits) reduces the double taxation of dividends
- **So: For personal taxes, equity dominates debt.**



Maximize After-Tax Income:

	Debt	Equity with (Deferred) Capital Gains	Equity with All Dividends
Corporate Level			
Start with \$1	1	1	1
Tax: T_C	0	T_C	T_C
Net	1	$(1 - T_C)$	$(1 - T_C)$
Personal Level			
Tax: T_P and T_{PE}	T_P	T_{PE}	T_P
Bottom Line	$(1 - T_P)$	$(1 - T_C) * (1 - T_{PE})$	$(1 - T_C) * (1 - T_P)$

Relative Tax Advantage of Debt: $(1 - T_P) / ((1 - T_C) * (1 - T_{PE}))$



Post-Clinton I:

	Debt	Equity with Capital Gains*	Equity with All Dividends
Corporate Level			
Start with \$100	100	100	100
Tax: 35%	0	35	35
Net	100	65	65
Personal Level			
Tax: 39% (20%)	$39\% * 100$ = 39	$20\% * 65$ = 13	$39\% * 65$ = 25.35
Bottom Line	61	52	39.65

*Extreme assumption: No deferral, 20% capital gains tax



Post-Clinton II: Some deferred capital gains

	Debt	Equity with Deferred Capital Gains*	Equity with All Dividends
Corporate Level			
Start with \$100	100	100	100
Tax: 35%	0	35	35
Net	100	65	65
Personal Level			
Tax: 39% (10%)	$39\% * 100$ = 39	$10\% * 65$ = 6.50	$39\% * 65$ = 25.35
Bottom Line	61	58.5	39.65

*Assumption: Effective capital gains tax rate of 10%



Bottom Line

- Taxes favor debt for most firms.
- We will lazily ignore personal taxation in the rest of the course.
- ((most of the time)).
- But: beware of particular cases.



Implications: Leverage is good?

- Since taxes favor debt for most firms, should all firms be 100% debt financed?
- Why don't all firms lever up and save on corporate taxes?



The Dark Side of Debt: Cost of Financial Distress

- If taxes were the only issue, (most) companies would be 100% debt financed.
- Common sense suggests otherwise: If the debt burden is too high, the company will have trouble paying.
- The result: *financial distress*.

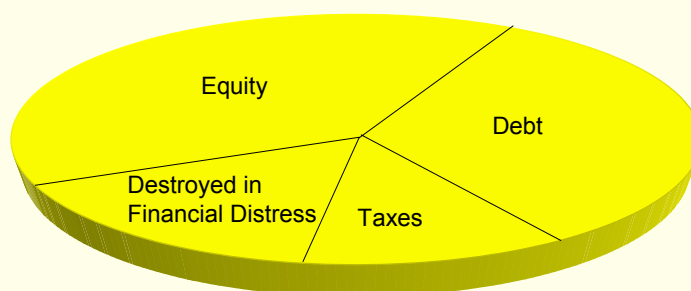


Financial Distress: Causes and Effects

- Financial Distress – Cash flow is not sufficient to cover current obligations, which starts a process of resolving the broken contract with creditors.
 - Private renegotiation or workout.
 - Bankruptcy, supervised by court.
 - Chapter 7 or Chapter 11.
 - See BM, Appendix to Chapter 25.
- It is important not to confuse the causes and effects of financial distress when identifying the potential “costs of financial distress”!
- Only those costs that would not arise outside financial distress should be counted:
 - Firms in financial distress perform poorly: Cause or effect?
 - Financial distress sometimes results in partial or complete liquidation of the firm’s assets: Would these not occur otherwise?



“Pie” Theory



Another Irrelevance Result

- Assume:
 - No administrative costs of financial distress
 - Frictionless bargaining between the different claimholders
- **Financial distress has no effect on operating decisions, thus no effect on firm value.**

Proof:

- “Financial Distress” simply states that current cash flows are insufficient to service the debt.
- Cash flows themselves do not change because of financial distress.
- Since value is determined by cash flows, financial distress per se does not affect value. **Q.E.D.**



Using This Sensibly

- Like M-M, this is not a literal statement about the real world.
- But it provides a useful benchmark:
 - What are the transaction costs in financial restructuring?
 - What is preventing claimholders from reaching a mutually beneficial agreement?
- It also warns against hasty conclusions. Only those costs that would not arise outside financial distress should be counted:
 - The fact that firms in financial distress often have falling sales, bad operating and poor financial performance is usually the cause, not an effect of financial distress.



With This in Mind: Costs of Financial Distress

Direct Bankruptcy Costs:

- Legal costs, etc...

Indirect Costs of Financial Distress:

- Debt overhang: Inability to raise funds to undertake good investments.
 - Pass up valuable investment projects
 - Competitors may take this opportunity to be aggressive
- Scare off customers and suppliers.
- Agency costs of financial distress.



Direct Bankruptcy Costs

- What are direct bankruptcy costs?
 - Legal expenses, court costs, advisory fees...
 - Also opportunity costs, e.g., time spent by dealing with creditors
- How important are direct bankruptcy costs?
 - Direct costs represent (on average) some 2-5% of total firm value for large companies and up to 20-25% for small ones.
 - But this needs to be weighted by the bankruptcy probability!
 - Overall, **expected** direct costs tend to be small



Indirect Costs: Debt Overhang

- XYZ's assets in place (with idiosyncratic risk) worth:

State	Probability	Assets
Good	1/2	100
Bad	1/2	10

- XYZ has a new investment project:
 - Today: Investment outlay \$15M
 - Next year: Safe return \$22M
- With 10% risk-free rate, XYZ should undertake the project:
$$NPV = -15 + 22/1.1 = \$5M$$



Debt Overhang (cont.)

- XYZ has debt with face value \$35M due next year.

Without the Project				
State	Proba.	Assets	Creditors	Shareholders
Good	1/2	100	35	65
Bad	1/2	10	10	0

With the Project				
State	Proba.	Assets	Creditors	Shareholders
Good	1/2	100+22=122	35	65+22=87
Bad	1/2	10+22=32	10+22=32	0

- XYZ's shareholders will not fund the project because:

$$-15 + [(1/2)*22 + (1/2)*0]/1.1 = -\$5M$$
- What's happening?



Debt Overhang (cont.)

- Shareholders would:
 - Incur the full investment cost: - \$15M
 - Receive only part of the return (22 only in the good state)
- Existing creditors would:
 - Incur none of the investment cost
 - Still receive part of the return (22 in the bad state)
- So, existing risky debt acts as a “tax on investment”
- **Shareholders of firms in financial distress are reluctant to fund valuable projects because most of the benefits go to the firm's existing creditors.**
- **This effect becomes stronger as the debt becomes more risky and financial distress more likely.**



What Can Be Done About It?

- Issue new debt?
 - Senior or junior to the outstanding debt?
- Financial restructuring?
 - Outside bankruptcy
 - Under a formal bankruptcy procedure



Issuing New Debt

- Issuing new debt with lower seniority as the existing debt
 - Will not improve things: the “tax” is unchanged
 - Issuing debt with same seniority
 - Will mitigate but not solve the problem: a (smaller) tax remains
 - Issuing debt with higher seniority
 - Avoids the tax on investment because gets a larger part of payoff
 - Similar: debt with shorter maturity (de facto senior)
- ❖ **However, this is often prohibited by covenants**



Financial Restructuring?

- In principle, restructuring could avoid the inefficiency:
 - debt for equity exchange
 - debt forgiveness or rescheduling
- Say creditors reduce the face value to \$24M (conditionally on the firm raising new equity to fund the project).

Without Restructuring				
State	Proba.	Assets	Creditors	Shareholders
Good	1/2	100	35	65
Bad	1/2	10	10	0

With Restructuring				
State	Proba.	Assets	Creditors	Shareholders
Good	1/2	122	24	98
Bad	1/2	32	24	8

- Will shareholders go ahead with the project?



Financial Restructuring? (cont.)

- Recall our assumption: Can discount all at same rate 10%.
- Compared to no restructuring (and no investment), shareholders get incremental cash flow of:
 - $98 - 65 = \$33M$ with probability $1/2$
 - $8 - 0 = \$8M$ with probability $1/2$
- The will go ahead with the restructuring deal because

$$-15 + [(1/2)*33 + (1/2)*8]/1.1 = \$3.6M > 0$$
- Creditors are also better-off because they get

$$5 - 3.6 = \$1.4M$$



Financial Restructuring? (cont.)

- When evaluating financial distress costs, account for the possibility of (mutually beneficial) financial restructuring.
- In practice, perfect restructuring is not always possible.
- But you should ask: *What are limits to restructuring?*
 - Banks vs. bonds
 - Few vs. many banks
 - Bank relationship vs. arm's length finance
 - Simple vs. complex debt structure (e.g., number of classes with different seniority, maturity, security,)



Debt Overhang: Preventive Measures

- Firms which are likely to enter financial distress should avoid too much debt.
- Firms which anticipate the need to raise funds in the future should avoid too much debt.
- Firms which expect to have valuable investment opportunities in the future should avoid too much debt.
- If you cannot avoid leverage, at least you should structure your liabilities so that they are easy to restructure if needed:
 - Active management of liabilities
 - Bank debt
 - Few banks



Scaring off of customers and suppliers:

- If a firm is in or close to financial distress:
 - Suppliers may demand cash payment
 - This may put a firm into financial distress – Macy's and the Garment Makers.
 - Customers may choose another vendor:
 - Why is this true?
 - For what types of companies is this not an issue?
 - Would it be a problem for Wilson Lumber?
 - Would it be a problem for Dell?



Agency Costs of Financial Distress

- Financial distress may motivate managers to act in (ex-ante) value-destroying ways.
- Examples:
 - Excessive risk-taking (gambling for resurrection).
 - Delay of (efficient) liquidation.
 - Cash-in-and-run: Take money out of company.
- Why are these strategies costly to shareholders?
 - Because debt-holders anticipate them and pay less for debt when issued.

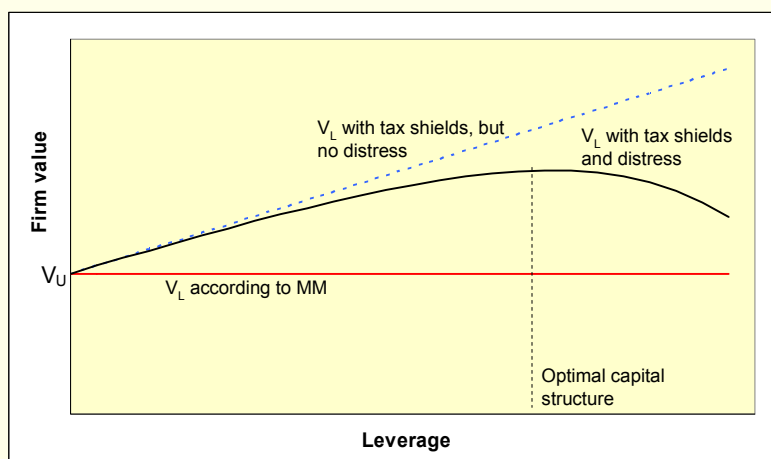


Textbook View of Optimal Capital Structure

1. Start with M-M Irrelevance
2. Add two ingredients that change the size of the pie.
 - Taxes
 - Expected Distress Costs
3. Trading off the two gives you the “static optimum” capital structure. (“Static” because this view suggests that a company should keep its debt relatively stable over time.)



Textbook View of Optimal Capital Structure II



Practical Implications: Expected Distress Costs Matter!

- Companies with “low” expected distress costs should load up on debt to get tax benefits.
- Companies with “high” expected distress costs should be more conservative.
- Thus, all substance lies in having an idea of what industry and company traits lead to potentially high expected distress costs.

$$\text{Expected Distress Costs} = (\text{Probability of Distress}) * (\text{Distress Costs})$$



Identifying Expected Distress Costs

- **Probability of Distress**
 - Volatile cash flows:
 - industry change
 - technology change
 - cyclical industry
 - macro shocks
 - start-up
- **Distress Costs**
 - Need external funds to invest in CAPX or market share
 - Financially strong competitors
 - Customers or suppliers care about your financial position (e.g., because of implicit warranties or specific investments)
 - Assets cannot be easily redeployed



Setting Target Capital Structure: A Checklist

- **Taxes**
 - Does the company benefit from debt tax shield?
- **Expected Distress Costs**
 - Cashflow volatility
 - Need for external funds for investment
 - Competitive threat if pinched for cash
 - Customers care about distress
 - Hard to redeploy assets



Does the Checklist Explain Observed Debt Ratios?

Industry	Debt Ratio (%)
Electric and Gas	43.2
Food Production	22.9
Paper and Plastic	30.4
Equipment	19.1
Retailers	21.7
Chemicals	17.3
Computer Software	3.5



What Does the Checklist Explain?

- Explains capital structure differences at broad level, e.g., between Electric and Gas (43.2%) and Computer Software (3.5%). In general, industries with more volatile cash flows tend to have lower leverage.
- Probably not so good at explaining small difference in debt ratios, e.g., between Food Production (22.9%) and Manufacturing Equipment (19.1%).
- Other factors are also important (more on that later).



Appendix (for your information)



Valuing the Tax Shield:

- Firm A has a perpetual before-tax, expected annual cash flow X
- It is 100% equity financed with required rate of return k

$$C_A = (1-t)X \quad \text{so that} \quad V(A) = \sum_{s=1}^{\infty} \frac{C_A}{(1+k)^s} = \frac{(1-t)X}{k}$$

- Firm B is identical but maintains debt with value D
- It thus pays a perpetual expected interest i

$$C_B = (1-t)(X-i) + i = (1-t)X + t \cdot i = C_A + t \cdot i$$

- The cash flows differ by the tax shield $t \cdot i$



Valuing the Tax Shield (cont.)

- Apply value additivity: Value separately C_A and $t \cdot i$
- We already know

$$PV[C_A] = V(A) = \frac{(1-t)X}{k}$$

- The TS's capitalized value is: $PV[\text{tax shield}] = t \cdot PV[i] = t \cdot D$

and

$$V(B) = V(A) + tD = \frac{(1-t)X}{k} + tD$$



Tax Shields with Personal Taxes

- Every year, XYZ Inc.:
 - generates a safe EBIT of $X = \$100$ in perpetuity
 - has debt paying an interest of $i = \$60$ in perpetuity
 - and retains the remaining $X - i = \$40$
- Assume the following tax rates:
 - Corporate taxes: $t = 34\%$
 - Personal taxes on interests: $d = 31\%$
 - For simplicity, single personal tax rate on equity (dividends + retained earnings): $e = 10\%$



Example (cont.)

- Each year, XYZ's debtholders receive:
$$60 - (31\% * 60) = (1 - 31\%) * 60$$
- Each year, XYZ's shareholders receive:
$$(1 - 10\%) * (1 - 34\%) * (100 - 60)$$
- Each year, the sum of these can be rewritten as
$$(1 - 10\%) (1 - 34\%) * 100 + [(1 - 31\%) - (1 - 34\%) (1 - 10\%)] * 60$$



M-M with Corporate and Personal Taxes

- More generally, XYZ's investors after-tax cashflow is:

$$(1-e)(1-t)X + [(1-d) - (1-e)(1-t)] \cdot i$$

- **Note:**

→ First term is cash flow if firm is all-equity financed

→ Second term is the revised tax shield of debt financing

- Capitalizing the tax shield yields the often used formula:

$$V(\text{with debt}) = V(\text{all equity}) + \left[1 - \frac{(1-t)(1-e)}{(1-d)} \right] \cdot D$$



“Proof”:

- We need to capitalize the annual tax shield:

$$[(1-d) - (1-e)(1-t)] \cdot i$$

- We know that a perpetuity of $(1-d)I$ is worth D

- Consequently, a perpetuity of

$$[(1-d) - (1-e)(1-t)] \cdot i = \frac{[(1-d) - (1-e)(1-t)]}{(1-d)} \cdot (1-d) \cdot i$$

must be worth

$$\frac{[(1-d) - (1-e)(1-t)]}{(1-d)} \cdot D$$



Debt or Equity?

- Given that

$$V(\text{with debt}) = V(\text{all equity}) + \left[1 - \frac{(1-t)(1-e)}{(1-d)} \right] \cdot D$$

debt has an overall tax advantage over equity if

$$\frac{(1-t)(1-e)}{(1-d)} < 1$$

- Otherwise, equity has an advantage over debt



Debt or Equity? (cont.)

- If equity pays large dividends, and d and e are similar, we can ignore personal taxes and debt dominates equity

$$V(\text{with debt}) = V(\text{all equity}) + t \cdot D$$

- If equity can avoid large dividends, it does not look as bad. Indeed, with $e < d$, the tax shield of debt is less than tD
- If shareholders can avoid capital gains taxation sufficiently (e.g., by delaying capital gains), equity can dominate debt
→ In the extreme case $e = 0$,

$$\frac{(1-t)(1-e)}{(1-d)} = \frac{(1-t)}{(1-d)} > 1 \quad \text{if } t < d$$

