

Net present Value : Work with after-transaction-Cost cash flows
and with after-transaction opportunity costs of capital

Munis no tax, treasuries have tax

Nominal return of bond being negative: in theory no

Empirical Evidence for MT: Hard to make money for large stocks
(many sellers and buyers)

Treasury are perfectly valued (fair rate of return)

$E(\text{Spice}) = \$30,000$, Sell ship = \$10,000

$P(\text{Spice}) = 1.000$ $P(\text{Ship}) = \$10,000$

$\text{CoC}(\text{Spice}) = 25\%$. $\text{CoC}(\text{Ship}) = 5\%$

$$\text{Ship} = -10,000 + \frac{0.4 \times \$10,000}{1.05} \approx -6190$$

$$\text{Spice} = -10,000 + \frac{0.4 \times \$30,000}{1.25} \approx +\$8600 \quad \text{Take it!}$$

Negative

<html>

Value A

Externalities

<head>

my grade

Pollution.

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Cannibalisation

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<tr><th> value </th> <th> A </th> <tr>

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Firms exist: cheaper & efficient when package together 合作

Capital-budgeting rule: Take all projects Combinations, including

Positive and negative externalities, to find the combo with highest values.

3 year \$250 expense for year 1, \$50 for year 2 Depre: 2 years

Revenue \$200,400,200 GC: 15% Tax: 40%, Debt: 200 ($r=10\%$)

	γ_1	γ_2	γ_3
Net Rev.	200	400	200
- Depre	125	125+25	25
Oper. Inc (EBIT)	75	250	175
- Interest	20	20	20
EBT	55	230	155
Taxes	22	92	62
NI	23	138	93

$$\gamma_1 \text{ CF } 2 \text{ Proj: } \$200 - \$22 - \$250 = -\$72$$

$$\text{CF } 2 \text{ Eq: } -72 + 200 - 20 = \$108$$

$$\gamma_2 \text{ CF } 2 \text{ Proj: } \$400 - \$92 - \$50 = \$258$$

$$\text{CF } 2 \text{ Eq: } 258 - 20 = \$238$$

N7

+ Interest

+ Dep

+ Δ Deferred tax

- Cap Exp

- Δ in Working Cap.

- Investment

+ Issue of debt

- Interest Exp

CF

Economics Cash flow

$$\text{CF to project: } \text{CF}_{\text{Op}} + \text{CF}_{\text{invest}} + \text{Interest Expense}$$

$$\text{CF to equity: } \text{CF}_{\text{pro}} + \text{Debt Issue} - \text{Interest Expense}$$

P/E ratio: Price / earnings high: overvalued low: stock price low

Growth firms

Ratios to earnings

NPV: conceptually good, real-world many problems

1. No objective standard for estimates
2. hard to get true value

Value by comparables with the whole firms (value attributes, proper comparables)
by NPV with a project.

Earnings more reflective, CF just period

$$\text{Perpetual: } P \approx \frac{E}{r-g}$$
$$P/E = \frac{1}{r-g}$$

Merged P/E is not the value-weighted P/E of two firms

A 20 P/E E \$10 B 200 P/E E \$1

Mitigate P/E 1/x problem 3. Use median

1. E/P ratio instead of P/E
2. Omit small / negative firms

Internet startup: Using price/sales ratio

Capital Structure

Cash flow right: Right to get money back

Debt: Get first. Particular amount Equity: Get the rest.

Forms

Convertible Debt: holders have the right to convert the debt

into stock shares (pre-determined price) ↗ in the money / OTM

Secured Debt: Secured with some assets / collateral

Senior: Paying order, get the money first.

Sinking Fund: When issuing bonds, firm will buy back a certain fraction of bond every year

Common Equity: no ability to push firm into bankruptcy

Preferred Equity: Tend to have higher fixed dividend, gets money first.

Warrants: Pretty much the same as options, except issuing new

shares to holders instead of buying in the market.

Class A and Class B shares: different voting rights.

different traded prices, and different dividends.

$$\text{Leverage} : \frac{\text{Financial Debts}}{\text{FD} + \text{Equity}} \quad \text{or} \quad \frac{\text{TL}}{\text{TA}} \quad \} \text{ book values}$$

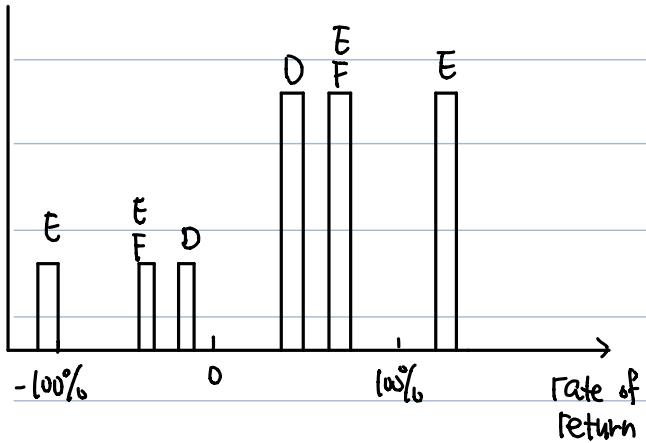
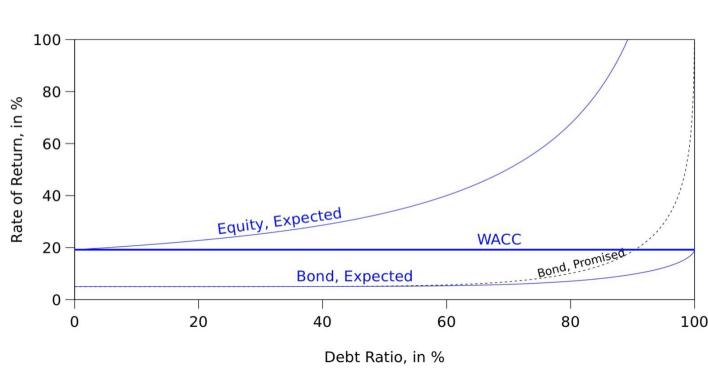
→ didn't consider NFL

use $TA = \text{book value of equity} + \text{market value of equity}$ to find new TA

Under perfect capital market, the value of a firm doesn't depend on equity or debt.

Imperfect

Event	Prob	Pay off	Debt	Equity
Up	3/4	100	⑦ $65 \times \text{promise} = 76$	⑦ 24
Down	1/4	60	③ 60	④ 0
E(U)		90	⑥ 72	⑧ 18
PV		75	① 65	② 10
E(Γ)		20%	10.77%	80%



WACC Weighted average

$$W_{debt} = \frac{65}{75}$$

$$We = \frac{10}{75}$$

$$E_d(r) = 10.77\% \quad E_e(r) = 80\%$$

$$WACC = 0.866 \times 10.77\% + 0.133 \times 80\% = 20\%$$

Firm more levered, the debt riskier, cost of capital higher

equity CoC \uparrow & Debt CoC \uparrow \Rightarrow Firm CoC \uparrow

$$W_D \uparrow \cdot E(R_D) \uparrow = W_E \downarrow \cdot E(R_E) \uparrow$$

more weight on lower return, so it stays the same.

\therefore CoC (risk) of the firm doesn't depend on the leverage ratio

Real world is not perfect, managers care about capital structure

Firms go bankruptcy. taxes are the first to be paid, prior to interest, debt, equity, IRS being paid first.

Investors care about after-tax income.

Payments to creditors but not to shareholders can be deducted from profits.

Investment Cost	200	\$139.16 bond at $r = 8\%$
Operating Income	80	discount = 12%
Interest	12.52	$139.16 \times 8\%$
Income before tax	67.48	debt-to-value
Corp. Income Tax (30%)	20.24	$\frac{\$139.16}{\$231.91} = 60\%$
Corp Income, Post-tax	$\frac{280 - 20.24}{1.12} \approx 231.91$	
Project value:		

APV: add back the tax shelter, constant amount of debt

WACC: reduce the effective cost of capital, constant ratio

discount \$259.75 by 12%, not the WACC of 10.38%

Never add tax-shelter \$3.36 to the \$259.75

Tax-shelter : difference between firm w/ & w/o debt financing

	EV ₁	PV ₀	
60% EQ Fin	\$259.75	\$231.91	τ tax rate = 30%
100% EQ Fin	<u>\$256.00</u>	<u>\$228.57</u>	$r_D = 9\%$
	\$3.75	\$3.34	$D = \$139.16$
			$r = 12\%$

$$\frac{\tau \cdot D \cdot r_D}{1+r} = \frac{\$3.75}{1.12} = \$3.34 \quad PV = \frac{CF}{1+r} + \frac{\tau \cdot r_D \cdot D}{1+r}$$

as if 100% equity financed & fully taxed.

$E(R_{FA}) - \tau \cdot E(R_D) \cdot (DT/PV)$: tax-adjusted WACC

$$12\% - 30\% \times 9\% \times 60\% \approx 10.38\%$$

lever up by \$1 Billion for one year, saving $\frac{\tau \cdot r_D \cdot \$1B}{1+r}$

forever: $\frac{\tau \cdot r_D \cdot \$1B}{r}$, IRS doesn't allow

NFL: Mortgage a house and lease it for operating
Investing & financing doesn't separate with corporate taxes

Transfer pricing 国外 subsidiary corporation 合理避税

shareholders pay lower taxes than creditors on receipts

Personal income taxes: Debt worse than equity

Corporate : better than equity.

Corp Inc = 38% Personal Inc = 46% Capital Gains = 10%

Cash	Debt → Retailing	\$100 → \$60
\$100	Equity → Retailing	\$70 → \$63
	Debt → Endowed	\$100 → \$100
	Equity → Endowed	\$70 → \$70

$$\frac{PV_{W/F}}{WACC} = \frac{E(FCF)}{[1 + W_E E(\Gamma_E) + W_D E(\Gamma_D)(1 - \tau)]}$$

Personal reflected in $E(\Gamma_E)$
← Corp. tax

Don't need to adjust WACC / APC for personal taxes.

Market based leverage ratio's biggest determinant : Equity

Book value of equity can be negative whereas shareholders own money.

Perfect market

Event	Prob	Pay off	Debt	Equity
Up	3/4	100	⑥ 92	⑦ 8
Down	1/4	60	⑧ 60	⑨ 0
$E(U)$		90	⑩ 84	⑪ 6
PV		75	⑫ 70	⑬ 5
$E(\Gamma)$		20%	⑭ 20%	⑮ 20%

Investment Cost 200

Operating Income 80

Interest 0

Income before tax +80

VC : startup 有前景,

⇒ equity

otherwise ⇒ Debt

Corp. Income Tax (30%)	24
Corp Income , Post-tax	256

If the entrepreneur knows more about the projects than the outside investors, If he thinks the project is good he will want to fund with debt . otherwise equity

Geometric

$$a + ar + \dots + ar^{n-1} = a \frac{1-r^n}{1-r}$$

$$\text{Perpetuity } PV = \frac{c}{1+r} + \frac{c}{(1+r)^2} + \dots = \frac{c}{r}$$

$$\text{loan } \frac{c}{r} = PV = \frac{c}{1+r} + \frac{c}{(1+r)^2} + \dots + \frac{c}{(1+r)^T} = \frac{c}{r} \cdot \left[1 - \frac{1}{(1+r)^T} \right]$$

$$\text{Nominal rate} = 10\% \quad \text{Inflation} = 5\% \quad \text{Real} = \frac{10\%}{5\%} - 1$$

The Modigliani-Miller propositions state that in a perfect world, the value of a firm is independent of how it is financed. Instead, it is the underlying projects that determine the value of the firm. Firm Value = Project Value + Financing Value

挑选 target 不对称信息 moral hazard, adversary effect

Efficient Markets : one that sets the price correctly

Semi-Strong firm : Price reflects public, but not all private information.

Earnings can be manipulated

More information is good for investors

99% → 1% earn 10%

Short out-of-money option (call)

$$APV = \frac{E(\text{Cashflow})}{1 + E(r_{Firm})} + \frac{\tau [E(r_{Debt}) \times \text{Debt}]}{1 + E(r_{Debt})}$$

APV = Value as if 100% Equity Financed + Discounted Tax savings

Weighted Average Cost of Capital (WACC)

	Contingent Rate of Return		Expected
	Rain	Sun	Rate of Return
Unlevered (100% Equity)	\$60/\$75 – 1 = -20%	\$100/\$75 – 1 = 33%	\$90/\$75 – 1 = 20%
Loan (Bond)	\$60/\$65 – 1 = -7.69%	\$76/\$65 – 1 = 16.92%	\$72/\$65 – 1 = 10.77%
Shares (Levered Equity)	\$0/\$10 – 1 = -100%	\$24/\$10 – 1 = 140%	\$18/\$10 – 1 = 80%

WACC: Substitute Debt dollar amount for $w_{Debt}PV$, solve

$$PV = \frac{E(\text{cashflow})}{1 + E(r_{Firm}) - \tau[E(r_{Debt}) \times w_{Debt}]} = \frac{E(C)}{1 + WACC}$$

$$PV = \frac{E(\text{cashflow})}{1 + w_{Equity}E(r_{Equity}) - (1 - \tau)[E(r_{Debt}) \times w_{Debt}]} \\ = \frac{E(C)}{1 + WACC}$$

$$WACC = w_{Equity}E(r_{Equity}) + (1 - \tau)[E(r_{Debt}) \times w_{Debt}]$$

Clientele effects: different firms attract different investors. This reduces Uncle Sam's take. Investor clientele effects arise because they reduce overall tax payments.

High-tax, profitable firms: Make your “cash-cow” value firms in the highest tax bracket issue debt, so that their cash flows can be paid out as interest

Low-tax investors: Make your tax-exempt investors hold this corporate debt, so that the interest receipts remain untaxed at the recipient level.

High-tax investors: Make your high-tax individual investors hold stocks instead of bonds. They will then either receive capital gains (taxed very little) or dividends (taxed just a little more).

Low-tax firms: Make your low-tax firms finance themselves with equity, not with debt.

Other tax avoidance strategies: Leverage, Source shifting, buy low-tax firms (NOLs); leasing; multinational corporations can shift difficult-to-value profitable assets from a high-tax to a low-tax country; headquarter location.