Capital Structure

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Outline

1. **Irrelevance theorems:**
   - Fisher separation theorem
   - Modigliani-Miller

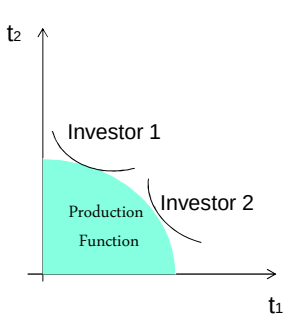
2. **"Textbook" views of Financing Policy:**
   - Static Trade-off Theory
   - Pecking Order Theory
   - Market Timing Theory

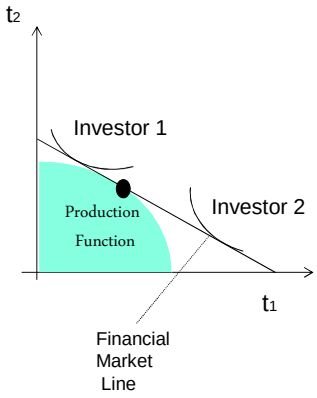
Fisher Separation Theorem

Investment decision **Financing decision**

Fisher Separation Theorem

Real markets **Financial markets**





The financial market

In the financial market, investors can trade ownership and financial rights

Equity: entitles to dividends and control rights
Debt: entitles to interest and repayment

Financing happens when a firm (issuer) sells these rights (issues equity/debt) for cash

That cash becomes capital. Today we talk about its "structure": how much equity, how much debt.

Modigliani-Miller

MM Theorem (without taxes for now).

- **Financial decisions are irrelevant for firm value.**
- **In particular, the choice of capital structure is irrelevant.**

Proof:

- All purely financial transactions are zero NPV investments, i.e., no arbitrage opportunity.

➔ They neither increase nor decrease firm value.

Q.E.D.

Assumptions

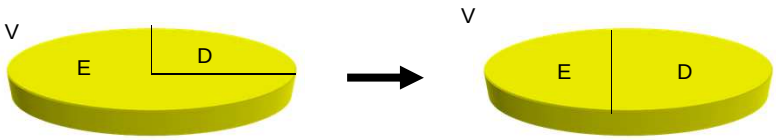
- No taxes
- No transaction costs
- No information asymmetry
- Corporations and investors borrow at same rate

M-M Intuition

- If Firm A were to adopt Firm B's capital structure, its total value would not be affected (and vice versa).
- This is because ultimately, its value is that of the cash flows generated by its operating assets (e.g., plant and inventories).
- The firm's financial policy divides up this cashflow "pie" among different claimants (e.g., debtholders and equityholders).
- But the size (i.e., value) of the pie is independent of how the pie is divided up.

In the words of Miller:

"Think of the firm… as a gigantic pizza, divided into quarters. If now you cut each quarter in half into eighths, the M and M proposition says that you will have more pieces but not more pizza."



Modigliani and Miller: a Proof

- Consider two firms with identical assets (in £m; can think of these as cash flows):

Asset (economic, not book) value next year:	Firm A	Firm B
In state 1:	160	160
In state 2:	40	40

- Firm A is financed with a mix of debt and equity:
  - Debt with one year maturity and face value £60m
  - Market values of debt D and equity E
  - Firm A's value is (by definition) $V_a = D + E$
- Firm B is all equity financed: Its value is V_b

Valuing Claims and Arbitrage

- Modigliani and Miller showed that it must be that $\mathbf{V_a = V_b}$ in order to rule out arbitrage in financial markets.
- No-arbitrage precludes investors making non-negative payoffs in all states, with strictly positive payoffs in some.
- The Proof of the MM Proposition follows from showing that if it did not hold, then price-taking and atomistic investors could make arbitrage profits, via buying the equity of a firm and "levering up" by financing part of this purchase with debt, or by buying both debt and equity.

The Homemade Leverage Proof

- Suppose to the contrary that $\mathbf{V_a > V_b}$
- That is, $V_a = E + D > V_b$, or $\mathbf{E > V_b - D}$
- Then investors could devise an arbitrage strategy:
- Let's say they do that for proportion *f* of the firm.
- First, they would buy a proportion *f* of B's equity by $\boldsymbol{f V_b}$
- Then, they sell *f* shares of **A** by $\boldsymbol{f E}$
- Then, borrow $\boldsymbol{f D}$ in return for promised future payment $\boldsymbol{f P}$
- Such a strategy delivers immediate profit of

$$\boldsymbol{f E - f V_b + f D = f E - f (V_b - D) > 0}$$

The Homemade Leverage Proof (cont'd)

- Such a strategy delivers next year's payoffs equal to
  - *In state 1: f* (160 – P) – *f* (160 – P) = 0.
  - *In state 2*: 0.
- Thus, money for nothing!
- However, given competitive and frictionless financial markets, **nobody** would buy A's Equity at such a high price.
- if $\mathbf{V_a < V_b}$, clearly the argument above can easily be reversed; investors would buy A's Equity and lend D, so as to replicate
- **Same** payoff as B's Equity.
- Note that nothing in this argument depended on P being risk-free.

The Curse of MM

- MM Theorem was stated for capital structure.
- But it applies to all aspects of financial policy:
  - Capital structure is irrelevant.
  - Long-term vs. short-term debt is irrelevant.
  - Dividend policy is irrelevant.
  - Risk management is irrelevant.
  - Etc.
- Indeed, the proof applies to all financial transactions because they are all zero NPV transactions.

Using MM Sensibly

- MM 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?
  - Taxes, Costs of Financial Distress, Information issues, Inefficient financial markets (behavioral finance)…
- MM exposes some fallacies such as:
  - WACC fallacy.
  - EPS fallacy.

WACC Fallacy: "Debt is Cheaper Than Equity"

- A firm's debt is (almost always) safer than its equity

➔ Investors demand a lower return for holding debt than for equity. (True)

➔ Firms should always use debt finance 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 implicit "hidden" cost of debt:
  Raising more debt makes existing equity more risky

- Note:
  - This has nothing to do with default risk.
  - This is true even if debt is risk-free.

Very practical implication:

- Gets us to be very careful with raw numbers!
- People often confuse the two meanings of "cheap":
  - Low cost.
  - Good deal.

In the words of Miller:

- "Think of the firm… as gigantic tub of whole milk.
- The farmer can sell the whole milk as is.
- Or he can separate out the cream and sell it at a considerably higher price than the whole milk would bring.
- (That's the analog of a firm selling low-yield and hence high-priced debt securities.)
- But, of course, what the farmer would have left would be skim milk with low butterfat content
- and that would sell for much less than whole milk.
- That corresponds to the levered equity."

EPS Fallacy: "Debt is Better When It Makes EPS Go Up"

- EPS (earnings per share) can go up (or down) when a company increases its leverage. (True)
- Companies should choose their financial policy to maximize their EPS. (False)

What is wrong with this argument?

M&M Proposition and the EPS fallacy

- Consider the following firm, which does not pay taxes and has 10 shares outstanding
- The actual cash flows can be higher or lower than the expected value. Say the distribution of cash flows is

	High	Expected	Low
EBIT	30	20	10
Interest Payments	0	0	0
Net Income			
EPS			

EPS = "earnings per share"

- Suppose that the discount rate that appropriately reflects the risk of cash flows is 10%

Firm Value and Leverage

- Assume first that the firm is all equity financed with 10 shares outstanding

firm value = share price =

- Suppose now that we are issuing debt to repurchase 5 shares. The cost of debt is 7%, and we issue perpetual debt

Shares Outstanding	5
Debt Value	100
r_D	7%
Interest Payment	

	High	Expected	Low
EBIT	30	20	10
Interest Payments	7	7	7
Net Income			
EPS			

- Does debt change expected cash flows?
- Does debt change the risk of cash flows?

Firm Value and Leverage (cont.)

- Firm value = D + E = (risk-adjusted) present value of expected cash flows
- Since debt has no effect on either expected cash flows or on their risk, firm value must still be the same!
- Notice though that earnings per share are changing

	EBIT	EPS No Leverage	EPS with leverage
low	10	1	0.6
expected	20	2	2.6
high	30	3	4.6

Firm Value and Leverage (cont.)

- The share price must also be the same!

  V = 200 = D + E

  Since D = 100, then E = 200 – 100 = 100

- Since there are now 5 shares outstanding, the share price must be equal to:

$$\text{Share Price} = \frac{\text{E}}{\text{Shares outstanding}} = \frac{100}{5} = 20$$

- How can this be consistent with a higher earnings per share ?

Leverage and Equity Risk

- The answer is that *the risk* of equity also goes up
- We can also write the share price in this example as:

$$\text{Share Price} = \frac{\text{EPS}}{r_E}$$

EPS → earnings = cash flows to shareholders because there are no taxes or depreciation

r_E → cost of equity

No leverage	High leverage
$\text{Share Price} = \frac{2}{0.1} = 20$	$\text{Share Price} = \frac{2.6}{r_E} = 20$

- The cost of equity in the high leverage case must then be equal to

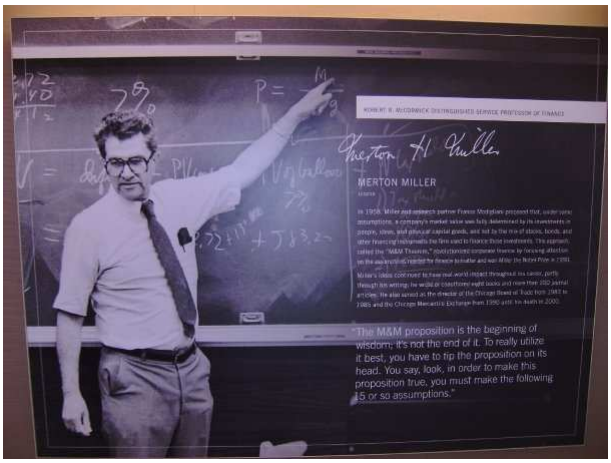
$$r_E = \frac{2.6}{\text{Share Price}} = \frac{2.6}{20} = 13\%$$

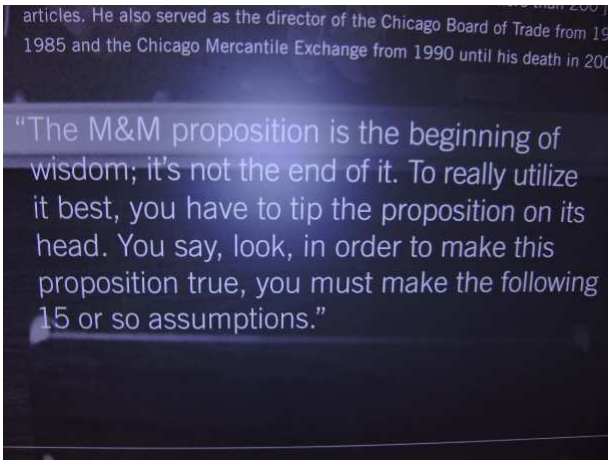
EPS Fallacy (cont.)

- EBIT is unchanged by a change in capital structure (Recall that we assumed no taxes for now).
- Creditors receive the safe (or the safest) part of EBIT.
- Expected EPS might increase but EPS has become riskier!

Very practical implications!

- Tells us to be careful with equity-based performance measures.
- Can we compare P/E of companies with different leverage?
- Can we compare ROE of companies with different leverage?





Static Trade-off Theory

Relaxes two MM assumptions:

- No taxes.
- Financing does not affect cash flows.

Theory 1: Static Trade-off Theory

- Benefits of Debt: e.g., Tax advantage relative to equity.
- Cost of Debt: e.g., Financial Distress.
- The optimal target capital structure is determined by balancing:

  Tax Shield of Debt vs. Expected Costs of Financial Distress

- **Note:** The theory does not give you a precise target but rather a range, an order of magnitude.

The Bright Side of Debt: The 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**

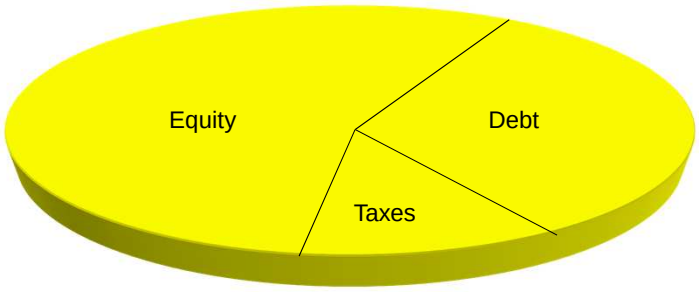
Intuition

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

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

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

"Pie" Theory



Warning: Debt only generates tax shields if it replaces equity

- Raising debt does not create value per se, i.e., you can't create value by borrowing and putting the cash in a bank account.
- It creates value relative to raising the same amount in equity.
- Hence, firm value is increased by the tax shield when you:
  - Finance an investment with debt rather than equity.
  - Undertake a recapitalization, i.e., a financial transaction in which some equity is retired and replaced with debt.

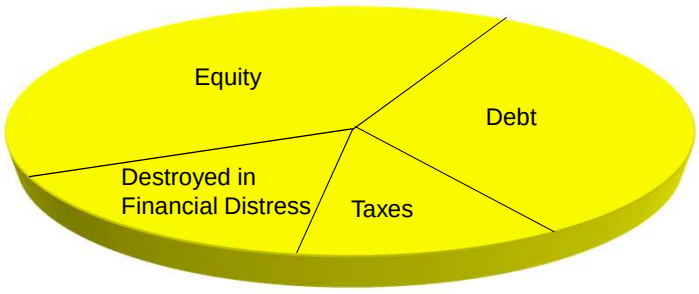
The Tax Cost of Excess Cash

- Excess Cash:
  - Part of Cash that is not useful to run operations.
  - Invested in financial assets (hopefully).
  - It's like "negative" debt for the company.
  - In fact, often consider Net Debt = Debt - Cash
- Comes with a negative tax shield!
- Note: In practice, it is sometimes hard to pin down exactly how much Cash is Excess Cash.

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*.

"Pie" Theory



Expected Costs of Distress: Two Terms

Expected costs of financial distress

=

(Probability of Distress) x (Costs if actually in distress)

Probability of Distress: Cash Flow Volatility

- Is the industry risky?
- Is the firm's strategy risky?
- Are there uncertainties induced by competition?
- Is there a risk of technological change?
- Sensitive to macroeconomic shocks, seasonal fluctuations?
- Is the firm a start-up?
- Etc.

Costs of Financial Distress

Direct Costs:

- Legal costs, etc.
- Usually small relative to tax shield benefits.

Indirect Costs:

- Debt overhang: Inability to raise funds for investment.
  - Pass up valuable investment projects.
  - Competitors may take this opportunity to be aggressive.
- Scare off customers, suppliers, employees.
- Need to sell assets below their fair value.

Costs of Financial distress: How big can they be?

- 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, for a firm not in bankruptcy, this needs to be weighted by the probability of bankruptcy.
- How important are indirect costs of financial distress?
  - These are harder to quantify, but they are potentially more important.
  - Andrade and Kaplan (1998, Journal of Finance) suggest costs around 10% and 23% of the value of the firm.

Some average numbers

American firms numbers.

- Benefit of debt: 10.4%
- Cost of debt: 6.9%
- Net benefit of debt: 3.5% of asset value

- Cost of using too little debt: 1.4%
- Cost of using too much debt: 3.8% of asset value

- Source: The cost of debt, Binsbergen et al. (2010)

Example of Indirect Costs of Financial Distress: Underinvestment caused by Debt Overhang

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

State	Prob.	Assets
Good	1/2	100
Bad	1/2	10

- XYZ has an investment project:
  - Today: Investment outlay £15m
  - Next year: Safe return £22m

- With 10% risk-free rate, XYZ should undertake the project:

NPV =

Debt Overhang (cont.)

- XYZ has debt with face value £35m due next year.

Without the Project				
State	**Prob.**	**Assets**	**Creditors**	**Shareholders**
Good	1/2	100	35	65
Bad	1/2	10	10	0
With the Project				
State	**Prob.**	**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 (e.g. by cutting today's dividend payment) because:

$$-15 + [(1/2) \times 22 + (1/2) \times 0]/1.1 = -£5m$$

Debt Overhang (cont.)

- Shareholders would:
  - Incur the full investment cost: - £15m
  - Receive only part of the return (22m only in the good state)
- Existing creditors would:
  - Incur none of the investment cost
  - Still receive part of the return (22m in the bad state)
- **Shareholders of firms in financial distress may be reluctant to fund valuable projects because most of the benefits would go to the firm's existing creditors.**

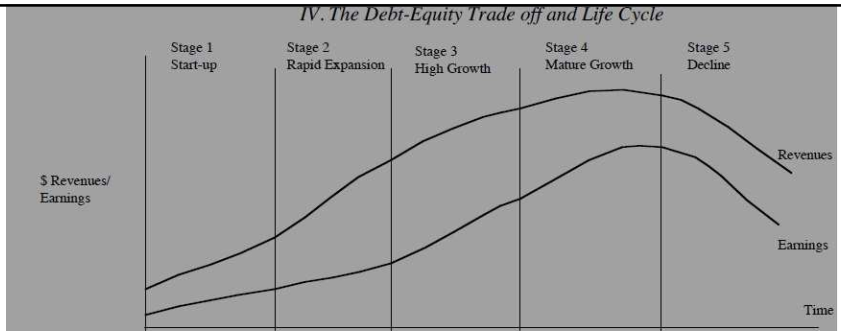
Raising Equity

- How to raise outside equity to finance the new investment?
- New shareholders must break even:
  - They may be paying the investment cost
  - But only because they receive a fair payment for it
- This means someone else is de facto incurring the cost: the existing shareholders! So, they will refuse again.
- **Firms in financial distress may be unable to raise funds from new investors for positive NPV projects, because most of the benefits from its investment would accrue to the firm's existing creditors.**

Static Trade-off Theory: Checklist

- **Tax Shield:**
  - Would the firm benefit from debt tax shield? Is it profitable?
- **Expected distress costs:**
  - Are cash flows volatile?
  - Need external funds to invest in CAPEX or market share?
  - Competitive threat if pinched for cash?
  - Customers and suppliers care about distress?
  - Are assets easy to re-deploy?
- Firms with…
  - … "low" expected distress costs should load up on debt.
  - … "high" expected distress costs should be conservative.

IV. The Debt-Equity Trade off and Life Cycle



Tax Benefits	Zero, if losing money	Low, as earnings are limited	Increase, with earnings	High	High, but declining
Added Disceipline of Debt	Low, as owners run the firm	Low. Even if public, firm is closely held.	Increasing, as managers own less of firm	High. Managers are separated from owners	Declining, as firm does not take many new investments
Bamkruptcy Cost	Very high. Firm has no or negative earnings.	Very high. Earnings are low and volatile	High. Earnings are increasing but still volatile	Declining, as earnings from existing assets increase.	Low, but increases as existing projects end.
Agency Costs	Very high, as firm has almost no assets	High. New investments are difficult to monitor	High. Lots of new investments and unstable risk.	Declining, as assets in place become a larger portion of firm.	Low. Firm takes few new investments
Need for Flexibility	Very high, as firm looks for ways to establish itself	High. Expansion needs are large and unpredicatble	High. Expansion needs remain unpredictable	Low. Firm has low and more predictable investment needs.	Non-existent. Firm has no new investment needs.
Net Trade Off	Costs exceed benefits Minimal debt	Costs still likely to exceed benefits. Mostly equity	Debt starts yielding net benefits to the firm	Debt becomes a more attractive option.	Debt will provide benefits.

Pecking Order Theory

Relaxes another MM assumption:
No information asymmetries.

Example

- XYZ.'s assets in place: With proba.1/2, V = £150m or V = £50m
- All equity financed
- New investment project:
  - Discount rate: 10%.
  - Investment outlay: £12m.
  - Safe return next year: £22m
  - 22/1.1 = £20m
- NPV =
- Should XYZ undertake the project
  - if they have enough cash available?
  - if they need to raise external funds?

Example (cont.)

- If internally financed with cash:
  - Invest ➔ Existing shareholders gain £8m.
- XYZ will also be willing to issue equity:
  - Once the project funded, the firm is worth 100 + 20 = £120m.
  - Raise £12m by selling 10% of shares (after issue).
  - Existing shareholders get 90% x 120 = £108m.
  - To be compared with £100m if they did not invest.
  - Existing shareholders gain £8m.
- No difference between internal and external financing.

Example (cont.)

- Assume now that:
  - Managers know XYZ's existing assets to be worth £150m,
  - The market doesn't know if they are worth £50m or £150m.
- Internal financing: As before, existing shareholders gain £8m.
- Equity financing: Raise £12m by selling 10% of shares (after issue), valued by the market at 120 (i.e., 100 + 20).
  - Existing shareholders get 90% x (150 + 20) = £153m.
  - They gain only £3m on top of £150m if did not invest.
- Why?
  - 10% shares sold for £12m but really worth 10%x 170 =£17m
  - £8m gain on investment - £5m loss from under-pricing = £3m

External Finance: Debt or Equity?

- With debt financing:
  - Raise £12m and repay (1.1) x 12 = £13.2m next year.
  - Existing shareholders get the full £8m because:

    150 + (22 - 13.2)/1.1 = £158m

Implication:

- Good firms (those with assets in place worth 150M) will not want to issue equity, but will finance with debt.
- Investors would infer that equity issues are from bad firms (those with assets worth only £50M in the example).
- Consistent with finding that stock price falls on announcement of equity issue.

Why Is Safe Debt Better Than Equity?

- Its value is independent of the information.
- Managers and the market give it the same value.
- Safe debt is fairly priced, i.e., no under-pricing.
- **Note:** Risky debt is underpriced, but less so than equity. Will still want to issue risky debt instead of equity. However, for high leverage, costs of financial distress should be taken into account. Equity might dominate debt in this case.

Key Point: The Pecking Order

- Financing choices are driven primarily by valuation issues
- When funding their investment projects, firms will:
  - Preferably use retained earnings.
  - Then borrow from debt markets.
  - As a last resort, issue equity.

Market Timing

Relaxes another MM assumption:

Financial markets are efficient (i.e. prices equal fundamentals).

Inefficient Financial Markets

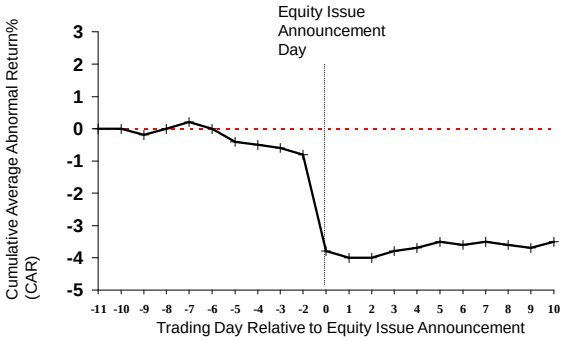
If markets are efficient:

- A firm's securities are fairly priced (i.e. = fundamental value).
- A firm will not benefit from financing one way rather than the other.

If markets are inefficient:

- A firm's securities may be over- or under-priced.
- A firm can be better off:
  - Issuing equity when it is over-priced.
  - Avoiding issuing equity when it is under-priced.
  - More generally, using the source of funds that is the most over-priced or least under-priced.

Stock price reaction to the announcement of equity offerings



$$AAR = \frac{S_t - S_{t-2}}{S_{t-2}} = -3.0\%$$

An example

	Food mmmmh	Food brrrrrr
Chef lets you try		
Chef does not let you try		

Asymmetric information: Equity issues

	Undervalued Share price too low	**Overvalued** Share price too high
Issue equity		
Do nothing		

Discounts in equity offerings

United States	• Average discount: 3%
UK	• Average discount: 16.4% • SEOs not always underwritten • Mostly rights issues

Market Timing and Capital Structure

Baker and Wurgler (2001, JF) propose an alternative theory for the evolution of capital structures:

- When the share price is overvalued by the market, managers issue equity to seize the opportunity.
- Same logic as pecking order theory (asymmetric information), but now the assumption is that unsophisticated (uninformed) investors do not understand the managers' opportunistic strategy
- As a consequence, firms with current low levels of leverage are the ones that had many market timing opportunities in the past.
- Evidence: firms with high market-to-book ratios issue more equity and have less debt in their capital structure.

Conclusion

- We have:
  - Discipline of MM.
  - Two textbook theories: STO and PO.
  - One soon to be textbook view: Market timing.
- What do we do with this?
  - Confront these theories to some business cases.
  - See whether and how much these tools are useful?
  - What do we do with several theories?
  - Draw our conclusions.