CAPITAL STRUCTURE:
AGENCY COSTS AND ASYMMETRIC INFORMATION

Capital structure so far…

- Previously…
- Perfect Capital Markets Assumptions:
  1. Securities are fairly priced (price equal to present value of cash flows)
  2. No transaction, issuance, trading costs
  3. No taxes
  4. Capital structure does not affect investment policy and cash-flows
     - E.g., no bankruptcy costs, no effect on management incentives
- M&M: In Perfect Capital Markets, capital structure doesn't matter!
- Then we considered tax benefit of debt vs. financial distress costs
  - Which assumptions behind perfect capital markets did we break here?
- Now: More violations of M&M…
- Situations where capital structure affects firm's business decisions and cash flows… (more violations of assumption 4)
  - Shareholders vs. Managers conflicts of interest
  - Shareholders vs. Debt-holders conflicts of interest
- Situations where securities might be mispriced… (violations of assumption 1)
  - Asymmetric information / Adverse selection

Shareholders vs. Managers Conflicts of Interest

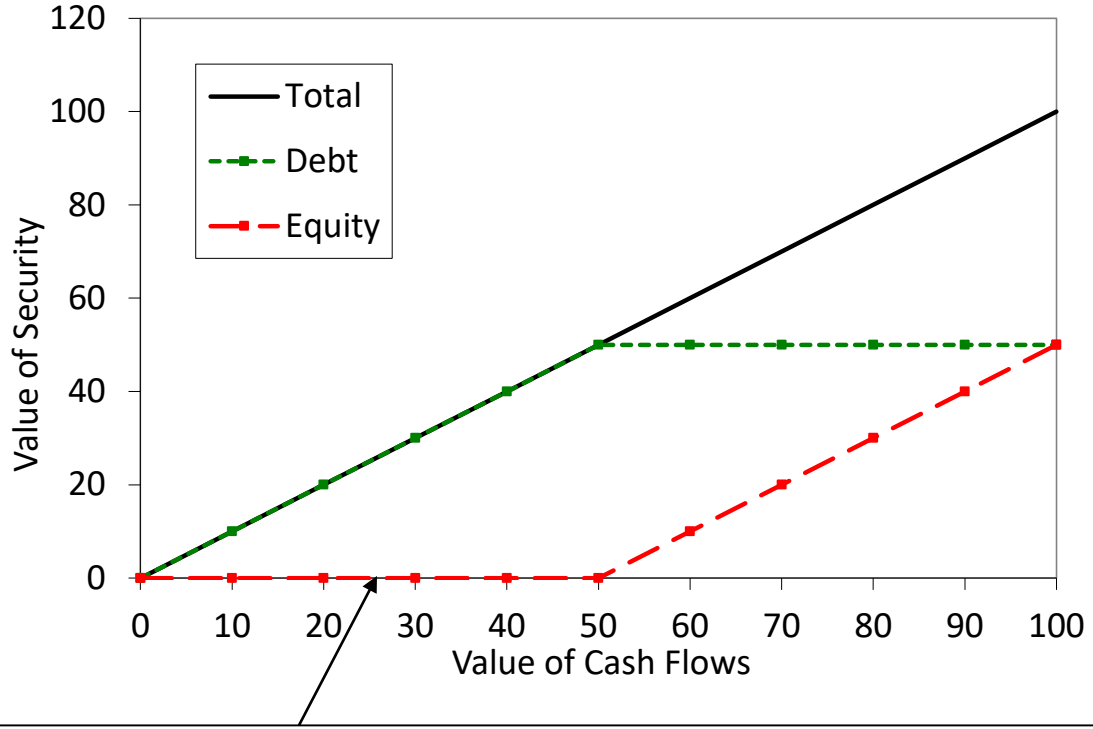
- Managers may make decisions that benefit themselves at investors' expense
- For example:
  - Spend excessively on perks or "pet projects"
  - Engage in "empire building"
  - Reduce their effort ("shirking")
  - Avoid risk ("live the quiet life")
  - Outright stealing
- We usually think of corporate governance as the solution to these problems, but debt can help too! How?
- Wasteful spending by managers is more likely when firms have high levels of "discretionary cash flow"
  - "discretionary cash flow" = cash flows *left over* after required debt payments and necessary investments
- How ensure the firm has less discretionary cash flow? More debt!
  → High leverage can force managers to be more careful with spending

Shareholders vs. Debt-holders Conflicts of Interest

The value of the firm $V = E + D$, which implies that $\Delta V = \Delta E + \Delta D$

- Most things that affect V also affect both E and D in that same direction
  - E.g., if we take a positive-NPV project then $V\uparrow$, and usually $E\uparrow$ and $D\uparrow$
  - Vice versa for negative-NPV projects
- → For *most* decisions, no conflict of interest between E and D, because both want V to increase and neither want V to decrease!
- But, some decisions have opposite consequences for E vs. D
  - E.g., some decisions could cause $E\uparrow$ and $D\downarrow$, or, $E\downarrow$ and $D\uparrow$
- In such situations, even a negative-NPV decision (where $V\downarrow$) could benefit shareholders
  - E.g., a project could have $\mathrm{NPV} = \Delta V < 0$ so $V\downarrow$, but $E\uparrow$ and $D\downarrow\downarrow$ and thus debtholders are hurt by more than shareholders gain
  - Managers, who have a duty to do what's best for *shareholders*, therefore might take such decisions!
- These situations are often not severe, but can become more significant if the firm has high leverage

Why The Conflict? Equity and Debt Payoffs



Shareholders don't care if losses occur once firm is in this range.
Shareholders also don't care very much to take on positive-NPV (value-increasing) projects.

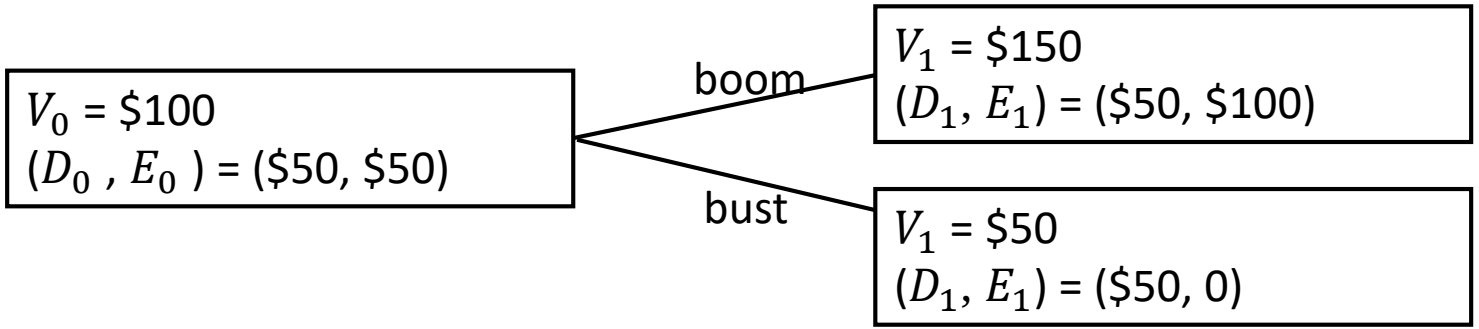
Three Types of Equity-Debt Conflicts of Interests

1. Wealth Transfer/Cashing out
   - Distribute as much cash as possible to shareholders
   - e.g., by selling assets or raising new debt and paying out the money to equity
   - Always works if decision has NPV=0, and might work even for NPV<0 (e.g., selling firm's assets at a big discount)
2. Risk-shifting (sometimes called "Asset substitution")
   - Take on very risky projects
   - This can work because E become more valuable when cash flows are *more volatile*
   - Always works if risky project has NPV=0, and might work even if project has NPV<0 but is sufficiently risky
3. Under-investment ("Debt overhang")
   - Reject positive-NPV projects that require equity to invest more money, because part of the value created goes to debt-holders
   - Difficult to incentivize E to do such projects even if good for firm value

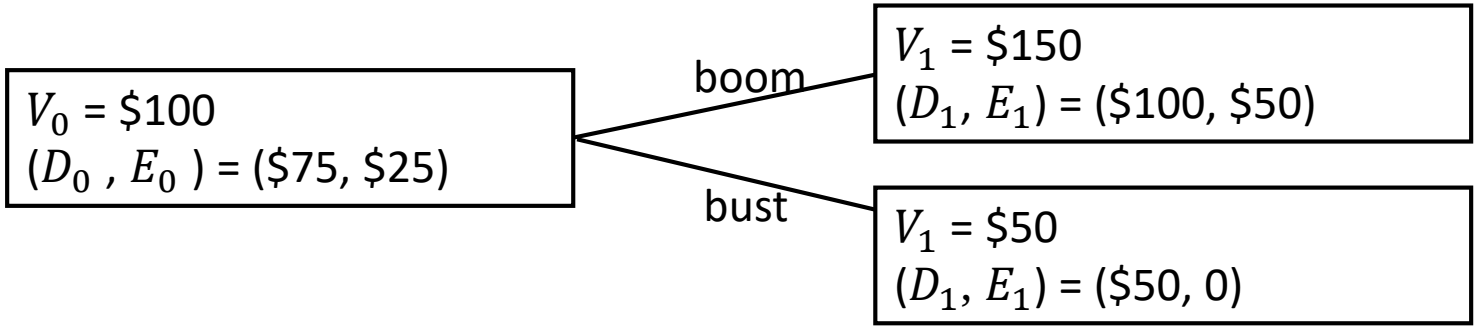
Example: Wealth Transfer

- Two periods: t = 0, and t = 1
- At t = 1 the state is either boom or bust, with equal probability
  - V_1 = 150 if boom
  - V_1 = 50 if bust
- Assume $r_f = 0$ and $\beta = 0$
  - Only to keep it simple; the logic is the same with positive interest rates and risk, but the math is messier!
- Then, firm has V_0 =100
- Suppose firm has debt with FV=50 due at t = 1

Example: Wealth Transfer (cont.)



Suppose the firm issues *more* debt with FV=50 (so total FV=100) and equal seniority to existing debt, and pays this money out to shareholders, then:



Example: Wealth Transfer (cont.)

- Value of old debt post-issue?
- Value of new debt?
- Value of equity post-issue?
- Value of equity post-issue plus payment to shareholders?

- Who won and who lost?
- Was value of total claims maintained?

Example: Wealth Transfer (cont.)

- The old debt and the new debt have same face value (both FV=50) and same seniority and therefore share in the total debt payments:
  - In boom, both get paid in full. But in bust, both get $25 each (because there's only $50 in total)
  - Value of old debt: ½ * 50 + ½ * 25 = 37.5
  - Value of new debt: ½ * 50 + ½ * 25 = 37.5
- So the new debt holders will pay $37.50 for this debt, which is used to pay out to shareholders)
- Value of equity (post-issue): ½ * 50 = 25 (they et $50 in boom, and nothing in bust)
- The old debtholders now have debt worth $37.50, but used to have debt worth $50 so they lost 12.50
- Shareholders now have a security worth $25 and $37.50 in cash → $62.50. They used to have equity worth $50 and thus gained 12.50

Takeaway: Wealth Transfers

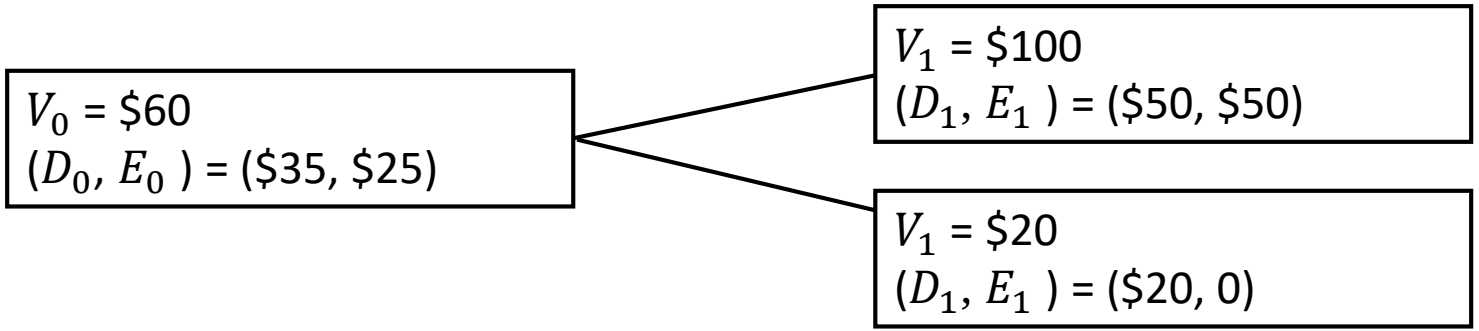
- Lesson: Additional debt has a negative effect on the "existing" ("old") debtholders, and is to the benefit of shareholders
- More blatant wealth transfers than this are possible
  - E.g., a firm can sell all its assets and use the money to pay a dividend to shareholders
- *Debt covenants* often try to prevent asset sales, new debt issuances, high shareholder payouts, etc…

Risk Shifting

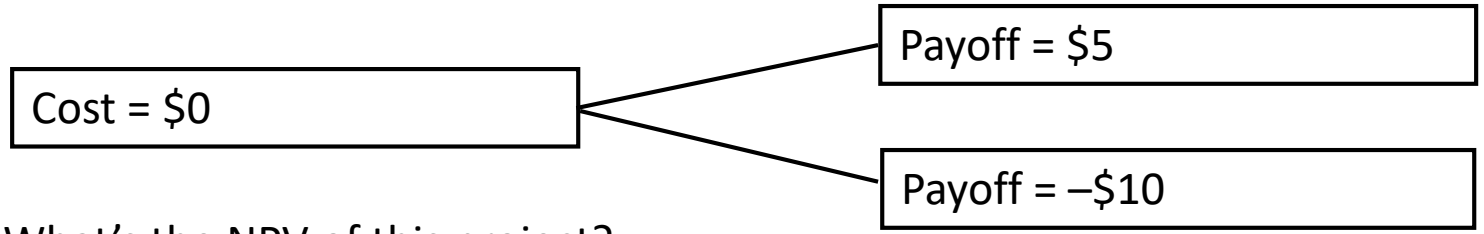
- Basic idea: shareholders' claim on the firm is worth more when the firm's cash flow is riskier (more volatile)
  - Equity is like a *call option* on firm value
    → Worth more when volatility high
  - Conversely, debt is like a *short put* on firm value
    → Worth less when volatility high
- This effect is strongest when there is a good (but not overwhelming) probability that the firm will go bankrupt
  - In option terms, when the "vega" is high
  - For a call option, vega is highest when stock price=strike price

Example: Risk Shifting

Suppose a firm has the following potential payoffs and debt with FV=50:



Now the firm has a new investment opportunity that costs zero but has the following incremental payoffs in boom/bust:

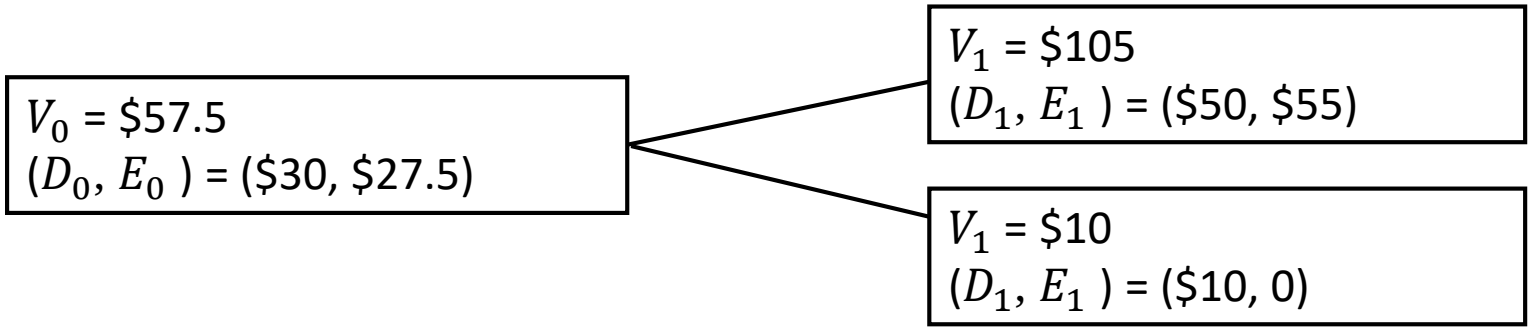


What's the NPV of this project?

Example: Risk Shifting (cont.)

What's the total payoff if the firm takes this project?

It increases V by 5 in boom, and reduces V by 10 in bust, so:



- Project decreases D by \$5 and increases E by \$2.5!
  - Do shareholders want to undertake project?
  - What do debtholders think of the project?

Example: Gambling with the firm’s money

- Fred Smith of FedEx goes to Vegas!

Another Real-World Example of Risk Shifting?

- The problem with "proving" that a firm is doing risk-shifting is that its difficult to measure the ex-ante NPV and volatility of projects, so we can't be sure what firms were thinking at the time
- A commonly suggested example is from the Savings and Loan (S&L) crisis in the 1980s
- S&Ls are banks with primarily mortgage loans as assets and deposits as liabilities
  - Known as a "3-6-3" industry: borrow at 3%, lend at 6%, and loan officers out playing golf by 3 p.m.!
- Early 1980s saw a combination of bad conditions for these banks
  - High interest rates, a recession, more competition, etc.
- Many S&Ls took on very risky (probably negative-NPV) loans that might push the bank deeper into bankruptcy if they went badly, but might save the firm if they paid off

Is risk-shifting a problem?

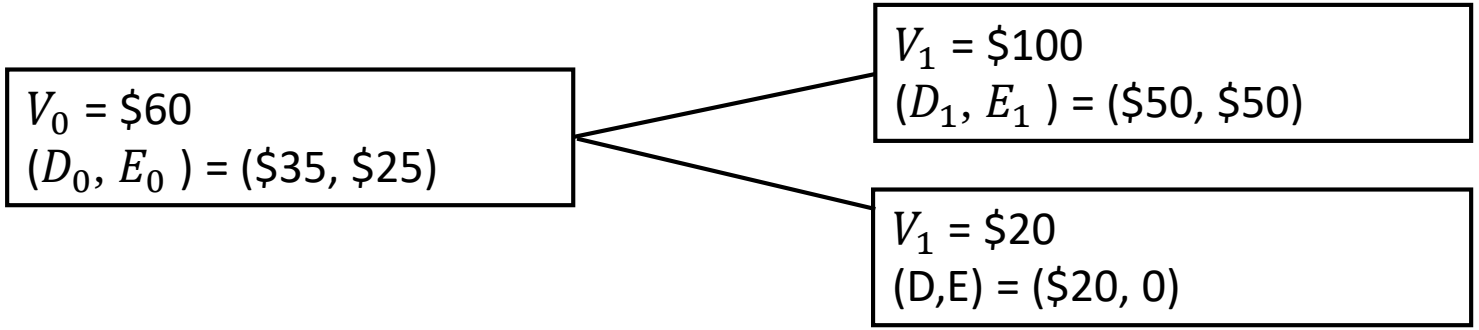
- Not necessarily a problem, if only a *transfer* between equity and debt!
  - Debtholders will pay less for the debt (anticipating the probability they may be exploited), but equity is correspondingly worth more (anticipating the probability of taking advantage of debtholders) → Total firm value constant
- But could be a problem (=be bad for firm value) if:
  - Results in firm taking negative-NPV projects only because they are risky
  - Covenants written to prevent risk-shifting also unintentionally prevent positive-NPV projects
- Difficult in practice to write covenants that only forbid risky negative-NPV projects, so covenants are likely to have some loopholes or unintended consequences
  - E.g., who's to determine exactly how risky and valuable a project is?

Under-investment / Debt Overhang

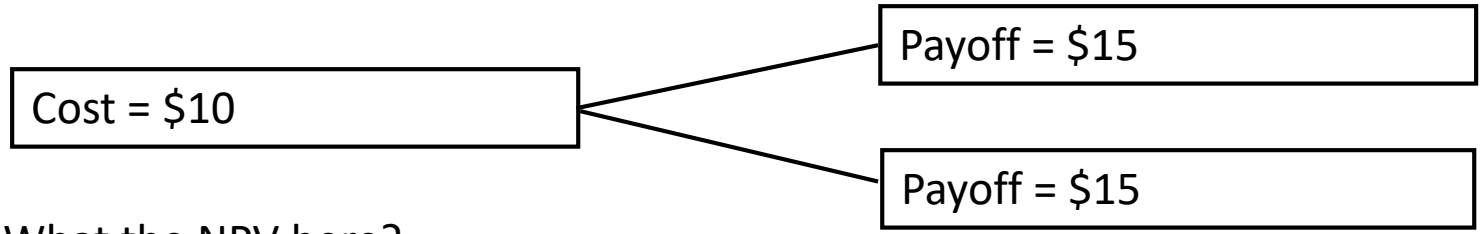
- If a firm's debt is risky, then the firm may not be able to raise any new financing, even to pay for positive-NPV investments
- Why? Some of this NPV will go to the existing debtholders!
- Analogy: suppose you're a homeowner and you can spend $1,000 of your own money to increase the value of your home by $10,000
  - This is a great investment!
  - Would you do it?
  - What if your house is $20,000 underwater?
- Such "debt overhang" can thus result in inefficient *underinvestment* (=not taking positive-NPV projects)

Numerical Example of Debt Overhang

Suppose a firm has the following potential payoffs and debt with FV=50:

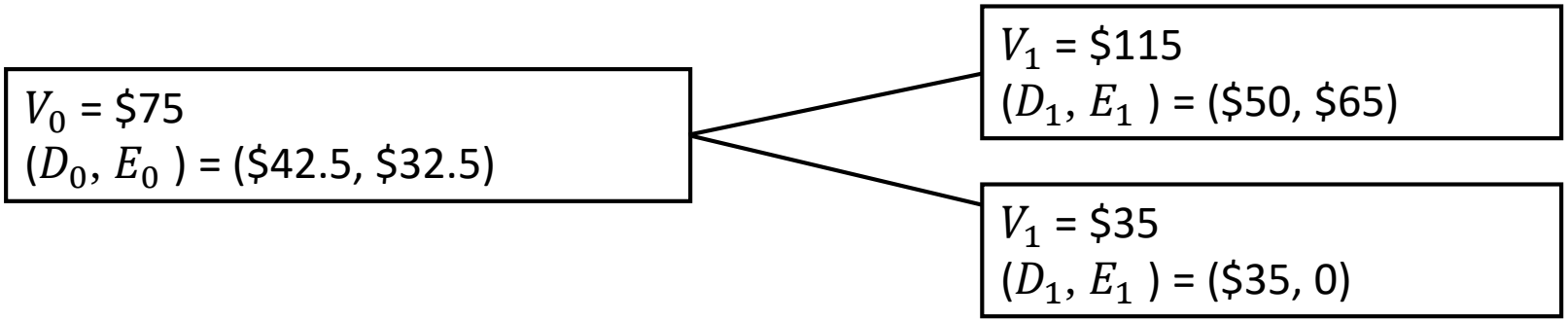


There's a new potential project the firm can take:



What the NPV here?

What happens if the firm takes the project?



- This investment raises the value of D and E at t=0 by \$7.5 each
- So can we raise \$10 of new equity (or debt) to pay for it?
- Solutions?

Takeaways so far

- Debt can **reduce** agency conflicts between investors and managers:
  - — Reduces discretionary cash flow problem
  - — Allows more concentrated equity ownership
- Debt can **increase** agency conflicts between debtholders and shareholders, through
  1. Wealth transfers
  2. Risk-shifting
  3. Debt overhang

Who ultimately pays for these conflicts of interest?

- Previously…
  - For ITS and CFD, we showed that shareholders get these benefits and bear these costs ex-ante
  - Even though it's debtholders who actually pay for the CFD in bankruptcy
- What about the benefits and cost arising from (avoiding) conflicts of interest?
- Again, the benefit/cost falls entirely on shareholders
  - Because debt-holders can *anticipate* these future conflicts, the firm will get less when it sells debt
  - Shareholders would be better off, if they could *commit ex-ante* to not exploit debt-holders *ex-post*
- Therefore, shareholders want to choose a capital structure that on net balances all the costs/benefits of having debt financing

“Extended” Trade-off Theory

Benefits of leverage

- Interest tax-shield
- Benefits from reducing agency conflict between shareholders and managers

Costs of leverage

- Costs of financial distress
- Costs from increasing agency conflict between shareholders and debtholders

$$V_L = V_U + PV(ITS) - PV(CFD) + PV(Agency\ benefits) - PV(Agency\ costs)$$

The optimal leverage L* is the leverage that maximizes V_L

Adverse selection

- Asymmetric information: One party in a transaction knows more than the other party
- For example, managers in a firm often have better information about the firm than investors
- Managers may use this superior information to take advantage investors:
  - For example, issuing equity when equity is overvalued; this is an example of general phenomenon called “adverse selection”
- Investors face a “lemons problem”
  - When investors are offered securities to buy, investors are aware of managers’ incentives, and rationally discount the price they are willing to pay
  - The magnitude of this discount depends on how *sensitive* the security’s value is to the *asymmetric information*
  - Equity is particularly sensitive! (debt less so)
- Is there evidence of adverse selection in the financial markets?
  - Equity offerings are associated with drops in share price!
- Knowing this, managers may not ever want to sell equity if they only can sell it at a large discount

Analogy: Used cars

- I may not want to buy a used car somebody else is eager to sell!
- Why? The current owner knows a lot more about the car that I do (*i.e.*, there is asymmetric information, so I'm worried about adverse selection)
  - Or if I do buy it, I'll offer a lower price to take into account all the problems the owner may not be telling me about!
- As a result, many car owners may not want to sell their cars at all if buyers are only going to pay a low price
- Who should be more discouraged from selling their cars—owners of "good" or "bad" cars?
  - The owners of bad cars know that people will discount the car "as-if" it is bad, but that may actually be a fair price
  - The owners of good cars don't want to sell their cars if it's going to be priced as if it's a bad car
- Therefore, worse-than-average cars are more likely to be offered for sale, and people are *correct* in discounting them on average

Sensitivity of adverse selection

- For what types of cars should this “lemons” discount be the largest?
  - Cars where the asymmetric information is more important (i.e., when what the owner knows matters more)
  - E.g., performance cars that you don’t know how hard they have been driven; or cars that have been registered in flood-prone states, etc.
- In corporate finance: What types of securities suffer less from adverse selection?
  1. More senior
  2. Shorter maturity
  3. Better collateralized
  4. Bought by more informed providers of capital
- For these securities, what the managers may know matters less

Example: Adverse selection

- Suppose the true value of Zycor shares is either $100, $80, or $60. The CEO knows the true value of the shares, but investors don't
  - Investors think each case is equally likely, so the current price is $80
- Suppose Zycor's CEO now announces that he is planning to sell most of his shares
- How will investors update their opinion about the true share price?
  - And will the CEO sell shares at the new price?

Solution

- If the true value is $100, the CEO would most likely not try to sell his shares for the current price of $80
- Investors conclude that the true value must be either $80 or $60, so the price drops to $70
- But if the true value is $80, the CEO must be really desperate to want to sell his shares for $70
- So if investors think that the CEO isn't willing to suffer that big of a discount ($10), they correctly assume that the true value must be $60
- The share price will then drop to $60, and the CEO will only do the sale if the true value actually is $60

Pecking Order

- **Pecking order hypothesis:** To avoid a “lemons” discount, managers first use forms of financing that has a smaller adverse selection problem and thus a lower discount
- Results in a **pecking order** for raising new financing:
  1. First look for internal funds (retained earnings)—no adverse selection
  2. If internal funds aren’t enough, then issue debt
  3. If can’t issue more debt, only then issue equity

Example: Pecking Order

- Axon Industries needs to raise $9.5 million for a new investment project
- If the firm issues debt, it has to pay an interest rate of 8%, even though Axon's managers believe that 6% would be a fair rate given the level of risk
- If the firm issues equity, they believe the equity may be underpriced by 5%
- What are the costs of financing the project out of retained earnings, debt, and equity?

Solution

- Retained Earnings
  - If the firm spends $9.5 million out of retained earnings, rather than paying that money out to shareholders as a dividend, the cost of financing the project is $9.5M.
- Debt
  - Using one-year debt costs the firm $9.5 $\times$ (1.08) = $10.26M in one year, which has a present value (based on management's view of the firm's true risk) of $10.26 $\div$ (1.06) = $9.68M
- Equity
  - If equity is underpriced by 5%, then to raise $9.5M the firm will need to issue shares that are actually worth $10M. Thus, the cost of financing the project with equity will be $10M
- Retained earnings is cheapest, followed by debt, then equity

Survey responses of 392 CFOs (Graham and Harvey (2001))

Do you have an optimal/target debt-equity ratio?

Very strict/somewhat tight target:	44%
Flexible target:	37%
No target:	19%

What factors affect the amount of debt for your firm?

(fraction that report important or very important)

Financial Flexibility (have enough internal funds for future projects)	59%
Credit Rating	57%
Volatility of Earnings	48%
Tax Advantage of Interest Deductibility	*45%*
Costs of Bankruptcy/Financial Distress	21%
Have Debt to make Firm Unattractive Takeover Target	5%
Tax Cost Faced by Investors when they Receive Interest Income	5%
To Ensure that Upper Management Works Hard	2%

All of these are reasons for having ***lower*** leverage!