FIN 325 Corporate Finance
L10 (Theory): Agency Costs of Leverage

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Motivation

- Recall the Modigliani & Miller theorem said that capital structure was **irrelevant** under certain conditions.

- Let's now relax the assumption that capital structure doesn't affect investment decisions.

- When a firm is all-equity financed, we saw that maximising the value of equity was the same as maximising the value of the firm.

- In the **presence of debt**, conflict can arise between debt and equity holders.

  - Equityholders want to maximise the **value of equity** rather than the value of the **firm**.

- **Agency costs** are the costs associated with these conflicts.

Why the conflict? (1)

- The conflict arises due to the difference in payout structure of the debt and equity holders.

- Recall from L0: **holding equity** is like taking a **long position in a call option** on the firm's assets.

- **Holding debt** in the firm is like taking a **long position in the firm's assets** in addition to **shorting a call on the assets**.

- They have different attitudes toward risk as a result!

Why the conflict? (2)

- Assume Firm Levered has debt with face value of $50 outstanding.
- It realises some cash flow this period.
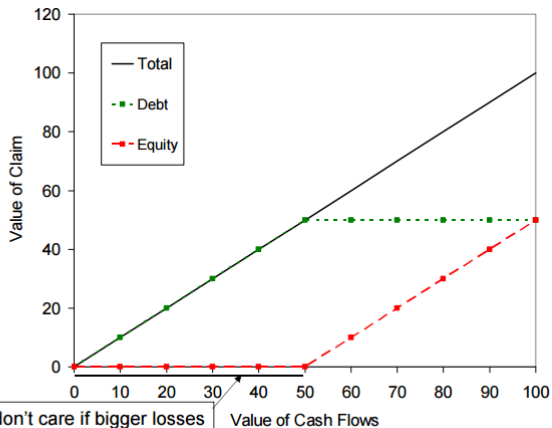
Equity holders don't care if bigger losses occur once firm is in this range

Agency costs of debt

- Several types of costs associated with the conflict.

- **Wealth transfers:** from debtholders to shareholders, (also known as cashing-out).

- **Risk shifting**: the option value of the equityholders is higher when the cash flows are more volatile, (also called asset substitution).

- **Debt overhang**: when we can't fund new projects if current debt is likely to be underwater.
  - Underinvestment problem.
  - Equityholders won't decide to fund new projects if current debtholders will capture the profits.

Debt seniority (1)

- Firms will often have several different types of debt on their balance sheets.

- Debt security A is senior to debt security B when the holder of security is entitled to receive the face value of his debt holdings **in its entirety** before holders of security B get **any** cash flows.

- Common terms to describe their seniority are **senior**, **mezzanine** or **junior** debt, (that are listed in decreasing order of seniority).

Debt seniority (2)

- Say that Firm Levered has some debt outstanding.

  - Say that the face value of their debt is F_1.

  - Say that the firm opts to issue some more debt now for some reason.

  - **Pari-passu** debt is debt of equal seniority to that of the incumbents.

  - Say the new issued debt is pari-passu and has face value F_2.

  - In the instance of Firm Levered **defaulting**, the new debtholders and old debtholders will receive payments out of what's left **in proportion to their debt's face value out of total outstanding debt face value**.

    - If the total firm value leftover in the case of default is Y then $\frac{F_1}{F_1+F_2} Y$ and $\frac{F_2}{F_1+F_2} Y$ will be allocated to the old and new debtholders respectively.

  - By defaulting here I mean that Firm Levered is **unable to meet all of its debt obligations**.

Wealth transfers example (1)

- Consider an example two period model ($t = 0$ and $t = 1$).

- At $t = 1$ the state can either be a boom or bust.
    - Each state has equal probability.
    - Value of firm is \$150 in boom v.s. \$50 in bust.

- Assume that there is no discounting for simplicity, (takes nothing away from the logic).

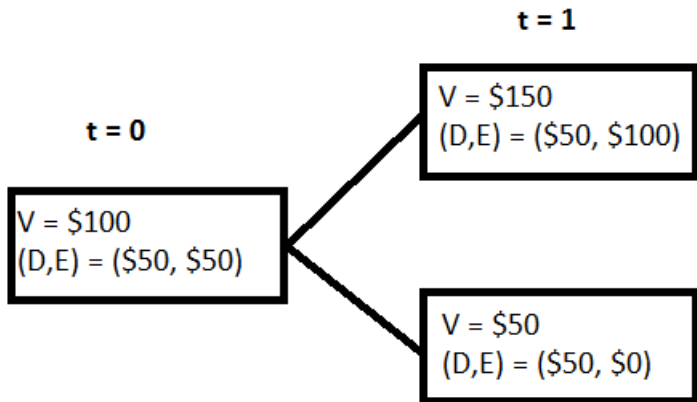- Let's assume that the firm has debt with face value of \$50m due at $t = 1$.

Wealth transfers example (2)

(1) What is the current market value of the firm?

(2) What is the current market value of the firm's debt?

(3) What is the current market value of the firm's equity?

Wealth transfers example (3): answers

- Then the current scenario for payoffs is as follows

t = 1

V = $150
(D,E) = ($50, $100)

t = 0

V = $100
(D,E) = ($50, $50)

V = $50
(D,E) = ($50, $0)
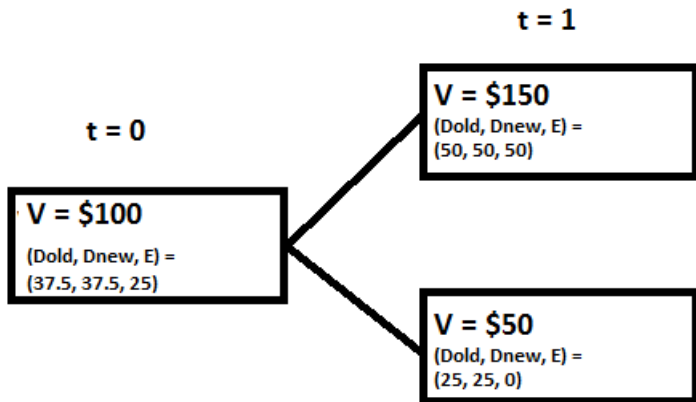
Wealth transfers example (4)

- Now assume that the firm issues **more debt** with a face value of 50 and equal seniority to the existing debtholders and to undertake a share repurchase.

  (I) What is the value of the old debt post-issue?

  (II) What is the value of the new debt?

  (III) What is the value of equity post-issue?

  (IV) What is the value of equity post-issue plus the payment to shareholders?

  (V) Who wins and who loses?

  (VI) Was the total value of claims maintained?

Wealth transfers example (5): answers

(1,2) The value of the **new debt** will equal the expected cash flows that the new debtholders will receive from the firm.

- In the good state, they'll receive $50 (full face value).

- In the bad state, they'll get $25, (total firm value divided by two).

- So the expected cash flow they'll get is $(0.5)(\$50) + (0.5)(\$25) = \$37.5$.

- The value of the **old debt** will now be the same as that of the new debt given that it has the **same seniority** and the **same face value**.

- The value to **equity** can be found similarly using the fact that they are the residual claimants.

Wealth transfers example (6): answers

- The payoffs and scenarios for the various stakeholders are given as follows.

t = 1

t = 0

V = $100
(Dold, Dnew, E) =
(37.5, 37.5, 25)

V = $150
(Dold, Dnew, E) =
(50, 50, 50)

V = $50
(Dold, Dnew, E) =
(25, 25, 0)

Wealth transfers example (7): answers

(IV) The equityholders' **total compensation** is given by $37.5 + 25 = 62.5$.

(V) The shareholders win (as $62.5 > 50$). The new debtholders are indifferent, (they only give as much cash as they receive in expectation). The **old debtholders lose**.

- The new debt is of equal seniority — squeezes-out the claims to the old debtholders.
- Equityholders pocket the cash!

(VI) The total value of the claims in the firm **remains unchanged**; so MM still holds.

- Issuing new debt to pay dividends would have the same result; also appears to be more blatant.
- Good exercise to try before the midterm exam!

Risk shifting example (1)

- The equityholders can **stand to benefit** when the firm assumes riskier projects.

- Circumstances under which this works are when the firm is close to bankruptcy.

  - Shareholders can get all the benefit from the extra risk with none of the downside.

  - E.g. take some funds from the firm and "let it ride" on the ponies.

Risk shifting example (2)

- Assume that the firm has some existing assets with the current payoff structure to stakeholders.

- Each state occurs with equal probability.

t = 1

t = 0

V = 100
(D, E) = (50, 50)

V = 60
(D, E) = (35, 25)

V = 20
(D, E) = (20, 0)
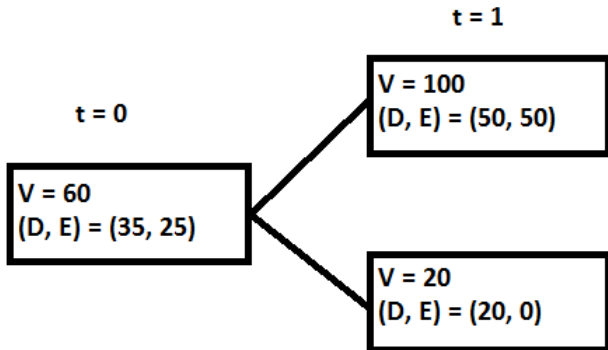
Risk shifting example (3)

- Then a new project comes along.

- In the upstate, (same as on the previous slide), it pays 5.

- In the downstate, (same as on the previous slide), it pays (-10).

- Assume no upfront cost of investment.

- Should management take the project?

- No! It destroys **firm value** — has a negative NPV of (-2.5)!

- But what happens if it does take the project?

Risk shifting example (4)

t = 1

t = 0

V = 105
(D, E) = (50, 55)

V = 57.5
(D, E) = (30, 27.5)

V = 10
(D, E) = (10, 0)
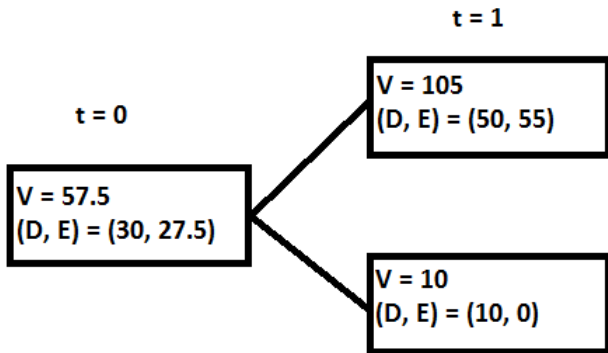
- The managers have destroyed value by taking this project!
- Value of equity increases by 2.5.
- Debtholders are the ones who lose-out.
- Transfer from bad state (where D is marginal claimant) to good state (where E is marginal claimant).
- Only arises when debt is not fully paid.

Debt overhang example (1)

- When incumbent stakeholders are reluctant to take new projects because gains will go to the existing creditors.

- This phenomenon leads to **underinvestment**.

- The firm may not be able to finance positive NPV projects.

- This is why growth companies, (e.g. high tech startups), will often avoid debt financing.
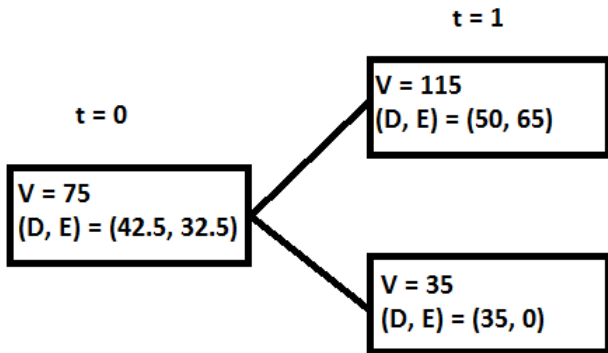
Debt overhang example (2)

- Consider a firm with the following setup, (again each state has 0.5 probability).

t = 1

V = 100
(D, E) = (50, 50)

t = 0

V = 60
(D, E) = (35, 25)

V = 20
(D, E) = (20, 0)
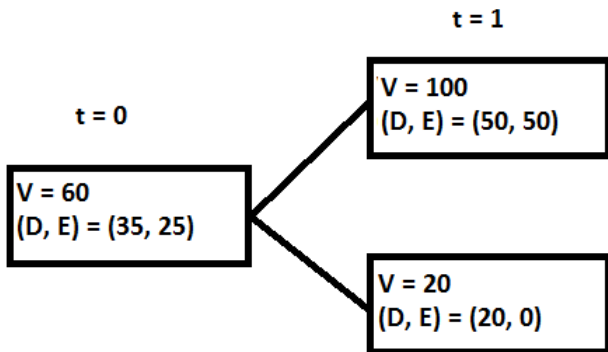
- Say an investment opportunity arises that costs 10 today and generates a certain payoff of 15 next period, (regardless of the state).
- What happens if the firm undertakes the investment by using external financing?
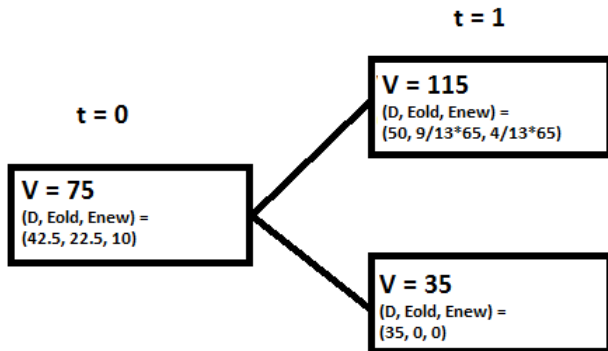
Debt overhang example (3)

t = 1

t = 0

V = 75
(D, E) = (42.5, 32.5)

V = 115
(D, E) = (50, 65)

V = 35
(D, E) = (35, 0)

- See that this investment will raise both D and E values at $t = 0$ by 7.5.
- Can the firm raise new equity to finance the upfront cost of 10?

Debt overhang example (4)

- How much of the firm will need to be surrendered to raise the upfront cost?
  - Let α be the fraction of the firm promised to the new equityholders.
  - $10 = \alpha(0.5[115 - 50]) + \alpha(0.5[0]) \Rightarrow \alpha = \frac{4}{13}$.

t = 1

V = 115
(D, Eold, Enew) =
(50, 9/13*65, 4/13*65)

t = 0

V = 75
(D, Eold, Enew) =
(42.5, 22.5, 10)

V = 35
(D, Eold, Enew) =
(35, 0, 0)

- What about through issuing new debt? Would equityholders want to take the new project now?

Who bears the cost of agency problems?

- Recall earlier that we saw the **existing shareholders** bear the cost/benefit of debt tax shields and financial distress costs.

- Same deal with agency problems.

- If debtholders anticipate agency problems, they'll adjust the price of the debt to incorporate the costs in expectation.

- Shareholders bear the agency costs ex-ante.

- Would be better-off if the shareholders could commit to not take these actions ex-post.

Back to the APV formula

- New formula for the value of the levered firm

$$V_L = V_U + PV(DTS) - PV(CFD) - PV(\text{Agency costs of debt})$$

- Agency costs reduce the value of a firm with leverage relative to one without.

- In the context of the debt overhang example, PV(Agency costs of debt) would have been equal to 15.

- An all-equity firm would have taken that project, so V_U would be 15 higher than V_L in the absence of tax shields and bankruptcy costs.

Takeaways

- When management **acts in the interest of the shareholders**, we can get a conflict of interest between shareholders and debtholders.

- Wealth transfers, debt overhang and risk shifting all impact the debtholders ex-post.

- New investors recognise this and price the costs into the funds.

- Reduces the value of the firm with leverage relative to that without.