Debt as a self-constraint under a takeover threat
Financing under asymmetric info: introduction

DEBT AS A VOLUNTARY SELF-CONSTRAINT (Zwiebel 1996)

Main Ideas:

(1) Manager (not shareholders) commonly undertake capital structure decisions.

(2) Takeover threat puts manager under pressure to abstain from unprofitable investments.

(3) Debt (and dividend payments) serve as a voluntary commitment by managers to credibly constrain future empire-building tendencies.

(4) Capital structure arises as an optimal response of managers to simultaneous concern for expanding and for retaining control.

Model

Consider the following model. There are two periods.

- The firms has no cash initially
- X is return from assets in place in each period
- In each period, the manager can undertake a new investment project. For simplicity, projects require no outlays, i.e., $I = 0$.
  - Bad project yields $-\Delta X$ and is always available
  - Good project yields $\Delta X < X$ and is available with probability θ which is a measure of the manager's ability. θ is independent across periods and is common knowledge.
  - Manager gets private benefits Z from running the firm and ΔZ from undertaking either project (per period)
  - At a cost c, raider can take firm over, in which case manager is dismissed and no project is available.
    * That is, takeover is successful iff it increases firm value by more than c.
    * c is measure of managerial entrenchment
  - If the firm goes bankrupt, efficient managerial retention decision is made by the new owners.

Sequence of moves in each period:

1. Manager chooses debt level K_t for this period.
2. Takeover occurs or not
3. Good projects becomes available or not
4. Manager makes investment decision
5. Returns realize, debt is repaid or not
6. If debt is not repaid, bankruptcy occurs.

Assumption: when a good project appears the manager always chooses it (imagine that the manager has share ε of the cash flows, then the preference for the good project will be strict).

Assume for now $K = 0$ in each period. Will the takeover threat discipline the manager?

Solving by backward induction:

- Denote W_2 – the cash remaining after period 1.
- If the manager remains in control, the expected value of equity at the beginning of period 2 is the sum of cash W_2 and total second period earnings $\theta\Delta X - (1-\theta)\Delta X + X$ ($K_2 = 0$):

$$E_2(\theta) = W_2 + \theta\Delta X - (1-\theta)\Delta X + X = W_2 + (2\theta - 1)\Delta X + X$$

- If takeover occurs, the value of equity E_2 is the sum of cash endowment W_2 and earnings from assets in place X:

$$E_2 = W_2 + X$$

- Takeover succeeds iff:

$$\begin{aligned} W_2 + X - c &> W_2 + (2\theta - 1)\Delta X + X \\ \theta &< \underline{\theta}_2 \equiv \frac{1}{2} - \frac{1}{2}\frac{c}{\Delta X} \end{aligned}$$

- that is, if manager is sufficiently inefficient (θ is small enough) and/or takeover cost c is low enough.
- Thus, if a manager survives to period 2, all $\theta \geq \underline{\theta}_2$ remain in control in period 2, while all $\theta < \underline{\theta}_2$ are taken over.

Consider first period.

- Consider managers with $\theta \geq \underline{\theta}_2$
- All managers with $\theta \geq \underline{\theta}_2$ know that they will not be taken over in the second period. Hence, if such managers are not removed at the beginning of period 1, they invest in either period irrespective of the project quality. The equity value E_1 is:

$$E_1(\theta) = 2\theta\Delta X - 2(1-\theta)\Delta X + 2X = 2(2\theta - 1)\Delta X + 2X$$

- If takeover occurs, the value of equity E_1 is:

$$E_1 = 2X$$

- Takeover succeeds iff:

$$\begin{aligned} 2X - c &> 2(2\theta - 1)\Delta X + 2X \\ \theta &< \underline{\theta}_1 \equiv \frac{1}{2} - \frac{1}{4}\frac{c}{\Delta X} \end{aligned}$$

- Since $\underline{\theta}_1 \geq \underline{\theta}_2$, all $\theta \geq \underline{\theta}_1$ remain in control in both periods.
- All $\underline{\theta}_2 \leq \theta < \underline{\theta}_1$ are removed in period 1 by a takeover

- What about $\theta \leq \underline{\theta}_2$?
  - They will be taken over in period 2. Hence, for these θ:

$$E_1(\theta) = \theta\Delta X - (1-\theta)\Delta X + 2X = (2\theta - 1)\Delta X + 2X$$

$$E_1 = 2X$$

Takover in period 1 occurs whenever

$$2X - c > (2\theta - 1)\Delta X + 2X \Longleftrightarrow \theta < \frac{1}{2} - \frac{1}{2}\frac{c}{\Delta X} \equiv \underline{\theta}_2$$

- To summarize, with no debt:
  - All $\theta \geq \underline{\theta}_1$ remain in control in both periods and always invest
  - All $\theta < \underline{\theta}_1$ are removed immediately by a takeover in period 1.
  - Thus, takeover threat alone has no disciplining role.

How can debt in period 1 help managers?

- All $\theta \geq \underline{\theta}_1$ has no need in isuing debt – they remain in control in both periods anyway.
- What about $\underline{\theta}_2 \leq \theta < \underline{\theta}_1$?
  - They would be retained in control if they could commit not to undertake bad projects in period 1.
  - They can do it by setting $X - \Delta X < K_1 \leq X$ and paying out all the proceeds as dividends

    Indeed, given they do not undertake inefficient projects in period 1:

$$E_1(\theta, K_1) = 2\theta\Delta X - (1 - \theta)\Delta X + 2X - K_1$$

$$E_1(K_1) = 2X - K_1$$

Takover in period 1 occurs whenever

$$E_1(K_1) - c > E_1(\theta, K_1) \Longleftrightarrow \theta < \underline{\theta}_K \equiv \frac{1}{3} - \frac{1}{3}\frac{c}{\Delta X} < \underline{\theta}_2$$

- – hence, thakeover in period 1 does not occur for $\underline{\theta}_2 \leq \theta < \underline{\theta}_1$

- - But what about commitment not to undertake bad projects?
    - $X - \Delta X < K_1 \leq X$ ensures it! It implies that the firm is bankrupt if a bad project is undertaken.
    - Given $\theta \geq \underline{\theta}_2$, the manager is removed following bankruptcy whenever (efficient retention decision):

      $$\theta \Delta X - (1-\theta)\Delta X + X < X \Leftrightarrow \theta < \frac{1}{2}$$

    - Hence, all $\underline{\theta}_2 \leq \theta < \underline{\theta}_1$ are removed by bankruptcy if they undertake a bad project.
    - Hence, they don't want to undertake a bad project as $2Z + \Delta Z > Z + \Delta Z$

- What about $\theta < \underline{\theta}_2$?
  - If still around, such types will be taken over in period 2.
  - Hence, if not removed in period 1, they undertake all period 1 projects, regardless of the debt level. Hence, they are either
    - taken over in period 1 if $K_1 < X - \Delta X$ (since $E_1(K_1) - E_1(\theta, K_1) = (1-2\theta)\Delta X - c < 0$)
    - taken over or removed by bankruptcy if $K_1 > X - \Delta X$ (if K_1 is too big, the raider will not want to take the firm over)
  - Hence, debt may only help them to survive till the end of period 1 (provided it's high enough).

Summarizing the outcome:

- Types $\theta \geq \underline{\theta}_1$ do not issue any debt, invest in all possible projects in both periods, and there is neither a takeover nor bankruptcy.
- Types $\underline{\theta}_2 \leq \theta < \underline{\theta}_1$ find it optimal to issue debt $X - \Delta X < K_1 \leq X$ in period 1 and to pay out proceeds from the debt issue. Because of this self-commitment, these managers turn down bad projects in period 1, and there is neither a takeover nor bankruptcy.
- Types $\theta < \underline{\theta}_2$ take high enough debt (and pay out the proceeds as a dividend) such that the takeover does not happen and are removed in bankruptcy at the end of period 1. They undertake all possible projects in period 1
  - Note: if the raider could renegotiate with the firm's creditors, these types would be taken over in period 1 and no bankruptcy would occur.

Benefits of Debt

- As in free-cash flow models, benefit of debt is its ability to constrain managerial empire-building tendencies, though the mechanism differs.
  - In free-cash-flow models, debt-constrained managers do not invest in unprofitable projects because they lack or cannot raise the necessary funds.
  - In Zwiebel, they abstain from bad projects because it would increase risk of bankruptcy and associated loss of control benefits.

Cost of Debt

- In free-cash flow models, excessive debt forces manager to forgo also profitable projects.
- In Zwiebel (1996), all profitable projects are always undertaken. Debt is costly because when excessive it does not constrain the manager. If bankruptcy is unavoidable regardless of the investment decision, the manager never refrains from bad projects.

Debt and Takeover Threat

- Neither takeovers nor debt alone can commit manager to forgo inefficient investments.
  - Without takeover threat, there is no pressure on managers to refrain from bad projects. Hence, all manager types would issue no debt and always invest.
  - Without bankruptcy threat, retention of manager does not depend on the current investment. That is, the risk of a takeover only depends on managerial ability θ, but not on the past and current investments. Thus, if the manager is still in control when investment decision is taken, he always invests.

Comment:

- In contrast to free-cash-flow models, debt and dividends are complements (rather than substitutes). Firms with high debt levels pay out a larger fraction of their earnings as dividends.
  - Firms pay out dividends despite its tax disadvantage (relative to retained earnings).
  - Unless the manager does not pay out earnings through dividends, debt does not restrict managers credibly and a takeover would occur.

Asymmetric Information and Outside Financing Introduction

Overview of the lecture:

- **Information Asymmetry in the Financial Market**
- **Costs of Outside Financing under Asymmetric Information:**
  - **Market Breakdown (Credit Rationing): Positive NPV projects are not financed**
  - **Overinvestment (Misallocation of Funds): Some negative NPV projects are financed**
  - **Costs incurred to prevent the above such as:**
    - **Monitoring**
    - **Signalling**

Model

Two dates $(t = 1, 2)$, no discounting

An entrepreneur owns the following project:

- At $t = 1$: Financing
  - Need $I > 0$
  - Entrepreneur's resources available for investment $A < I$
  - Competitive capital markets
- At $t = 2$: Cash flow
  - $X \in \left\{X^F, X^S\right\}$ with $\Delta X \equiv X^S - X^F > 0$
  - $\Pr\left[X = X^S\right] := p \in \{p_G, p_B\}$ with $p_G = p_B + \Delta p$. That is the entrepreneur can be either good or bad.
  - Investors' prior $\nu := \Pr[p = p_G]$
  - Average $\widehat{p} := \nu p_G + (1 - \nu) p_B = p_B + \nu \Delta p$
  - The project's value is: $V(p) = X^F + p\Delta X - I$

Assumption: The good type's project is valuable, i.e., $V(p_G) > 0$

Can be shown:

$$V(p_G) > 0 \Leftrightarrow V(p_B) + \frac{\Delta p}{p_G}(I - X^F) > 0$$

Assumption (for now): $X^F = 0$ (hence, debt $\equiv$ equity)

First Best

If $V(p) > 0$, the entrepreneur should raise funds by selling financial claims on the project's cash flow:

$$R^F = 0 \text{ and } R^S \leq X^S \qquad \text{such that} \qquad pR^S \geq I - A$$

For instance,

$$R^F = 0 \quad \text{and} \quad R^S = \frac{I - A}{p}$$

If $V(p) < 0$ no investment should be made.

Information Asymmetry

Assumption: Only the entrepreneur knows the true value of p.

Absent further information, the investors (assyming competitive market) will pay

$$\widehat{p}R^S$$

- As a result, investors would (on average):
  - make money on the "good" firms
  - lose money on the "bad" firms
- In other words:
  - Good firms would sell underpriced claims: $\widehat{p}R^S < p_G R^S$
  - Bad ones would sell overpriced claims: $\widehat{p}R^S > p_B R^S$
  - Hence, good firms would subsidize bad firms

Remark:

Here private information of the entrepreneur is “soft”, not “hard”

Questions we want to answer:

- Under what conditions will both types invest?
- Under what conditions will only good type invest?
- Can it happen that only bad type invests? Under what condition?
- Can it happen that nobody invests? Under what condition?

The Game

- Entrepreneur (each type) suggests R^S ($R^F = 0$ since $X^F = 0$)
- Having observed R^S, investors form their beliefs $\nu(R^S)$ that the entrepreneur is good, i.e. they actually form their expectation $\widehat{p}(R^S) = \nu(R^S)p_G + \left(1 - \nu(R^S)\right) p_B$ about p . Investors decide how much to invest (provided that this amount is at least $I - A$) Since, by assumption, investors are competitive, they pay $\widehat{p}(R^S)R^S$

We restrict ourselves to pure strategies.

Perfect Bayesian Equilibrium (PBE)

A Perfect Bayesian Equilibrium of this game is defined as:

Strategies: Strategies R_B^S and R_G^S for the bad and good type respectively

(Convention: $R^S = 0$ means that the entrepreneur does not undertake the project).

Beliefs: Investors' beliefs following any observed action R^S:

$$\nu(R^S) \equiv \Pr\left[p = p_G \mid R^S\right]$$

Incentive Compatibility Constraints: The strategies R_B^S and R_G^S are optimal for the bad and good type respectively, given the investors' beliefs formation

Bayes' Rule for beliefs:

$$\nu(R^S) = \frac{\Pr\left[(p = p_G) \cap R^S\right]}{\Pr\left[R^S\right]}$$

Since we only consider pure strategies:

- If $R_B^S \neq R_G^S$, investors' beliefs are $\nu(R_G^S) = 1$ and $\nu(R_B^S) = 0$

- If $R_B^S = R_G^S$, investors' beliefs are $\nu(R^S) = \nu$

Beliefs out of equilibrium:

- $\nu(R^S)$ is defined $\forall R^S$ (i.e., not only R_G^S and R_B^S)

- Beliefs following an out-of-equilibrium move are not pinned down by Bayes' Rule, i.e., for $R^S \notin \{R_B^S, R_G^S\}$, $\nu(R^S)$ can take any arbitrary value $\in [0, 1]$. We will set $\nu(R^S) = 0$ for $R^S \notin \{R_B^S, R_G^S\}$ to construct as much equilibria as possible; we can do refinements later.

Payoffs

$$\widehat{p}(R^S) = p_B + \nu(R^S)\Delta p$$

If the project is financed, the entrepreneur's expected payoff is

$$\underbrace{A}_{\text{available wealth}} + \underbrace{V(p)}_{\text{firm's actual value}} + \underbrace{\widehat{p}(R^S) \cdot R^S}_{\text{raised from investors}} - \underbrace{pR^S}_{\text{claim's actual value}}$$

which can be rewritten as

$$\underbrace{A + V(p)}_{\text{entrepreneur's true worth}} - \underbrace{\left(p - \widehat{p}(R^S)\right) R^S}_{\text{(potential) "discount" due to information asymmetry}}$$

Note: The discount can be negative

We will show that only three types of equilibria exist:

- Separating with only good type investing
- Pooling with both types investing
- Pooling with no type investing

Separating Equilibria with Both Types Investing?

- If the types play different actions, $R_G^S \neq R_B^S$, investors know exactly the type of the entrepreneur after observing an equilibrium signal:

$$\widehat{p}(R_G^S) = p_G \text{ and } \widehat{p}(R_B^S) = p_B$$

- The bad entrepreneur's payoff from playing R_B^S is:

$$\underbrace{A + V(p_B)}_{\substack{\text{entrepreneur's} \\ \text{true worth}}} \quad - \quad \underbrace{(p_B - p_B)\, R_B^S}_{\substack{= 0 \\ \text{no discount/premium}}}$$

- By deviating to R_G^H, he would get

$$\underbrace{A + V(p_B)}_{\substack{\text{entrepreneur's} \\ \text{true worth}}} \quad - \quad \underbrace{(p_B - p_G)\, R_G^S}_{\substack{< 0 \\ \text{negative discount}}}$$

Hence, **NO** such separating equilibrium exists.

Separating Equilibria with Only Bad Types Investing?

- The bad entrepreneur prefers investing to not investing iff:

$$A + V(p_B) \geq A \quad \text{or} \quad V(p_B) \geq 0$$

That is, if the bad entrepreneur's project has a positive NPV

- But then, by playing R_B^S, a good entrepreneur would get:

$$\begin{gathered} A + V(p_G) + p_B R_B^S - p_G R_B^S = \\ = A + p_G X^S - I + p_B R_B^S - p_G R_B^S = \\ = A + p_B X^S - I + p_G X^S - p_B X^S + p_B R_B^S - p_G R_B^S = \\ = A + V(p_B) + \Delta p X^S - \Delta p R_B^S \geq A \end{gathered}$$

That is, if G mimics B, he makes a profit.

Hence, **NO** such separating equilibrium exists.

Separating Equilibria with Only Good Types Investing?

Recall: by convention, if entrepreneur does not want to invest he says $R^S = 0$

- Given that $R_G^S \neq R_B^S$ and $R_B^S = 0$, the investors' beliefs are $\widehat{p}(R_G^S) = p_G$.
- By assumption, $V(p_G) > 0$, and the good entrepreneur invests
- The bad entrepreneur prefers not to invest iff:

$$A + V(p_B) + (p_G - p_B)\, R_G^S \leq A \quad \text{or} \quad R_G^S \leq R_{G_{\max}}^S \equiv -\frac{V(p_B)}{\Delta p}$$

- Moreover, the good entrepreneur needs to raise at least $I - A$:

$$p_G R_G^S \geq I - A \quad \text{or} \quad R_G^S \geq R_{G_{\min}}^S \equiv \frac{I - A}{p_G}$$

- Then, such a separating equilibrium exists iff $R^S_{G_{\min}} \leq R^S_{G_{\max}}$:

$$V(p_B) \leq -\frac{\Delta p}{p_G}(I - A)$$

which can be rewritten

$$V(p_G) \leq \frac{\Delta p}{p_B} A$$

Remarks:

- A necessary but not sufficient condition is $V(p_B) < 0$. Otherwise, bad entrepreneurs prefer investing.
- The condition is more likely to be satisfied:
  - for smaller $I - A$
  - for more negative $V(p_B)$
- Given that $R^S_{G_{\min}} \leq R^S_{G_{\max}}$, a continuum of separating equilibria exists:

$$R^H_G \in \left[\frac{I - A}{p_G}\ ;\ \min\left\{\frac{-V(p_B)}{\Delta p},\ X^S\right\}\right]$$

Pooling Equilibria with No Type Investing?

- If both types play the same action $R_B^S = R_G^S = R_0^S = 0$, Bayes' Rule does not pin down the investors' beliefs for any $R^S > 0$.
- Set $\nu(R^S) = 0$ for all $R^S > 0$, as this makes investing least attractive for G.

- The bad entrepreneur prefers not to invest iff:

$$V(p_B) \leq 0$$

which can be rewritten as

$$V(p_G) \leq \frac{\Delta p}{p_B} I$$

- The good entrepreneur prefers not to invest iff:

$$\begin{aligned} A + V(p_G) + p_B \frac{I-A}{p_B} - p_G \frac{I-A}{p_B} &\leq A \\ &\Longleftrightarrow \\ V(p_G) &\leq \frac{\Delta p}{p_B}(I-A) \end{aligned}$$

which is stronger than the above condition for the bad type.

(note: we took $R^S = \frac{I-A}{p_B}$ for G out of equilibrium in order to minimize the discount)

Pooling Equilibria with Both Types Investing?

- If $R_B^S = R_G^S = R_0^S > 0$, the investors' beliefs are:

$$\widehat{p}(R_0^S) = \widehat{p}$$

- The entrepreneur is able to raise $I - A$ iff

$$R_0^S \geq R_{0_{\min}}^S = \frac{I-A}{\widehat{p}}$$

which is feasible iff

$$R_{0_{\min}}^S = \frac{I-A}{\widehat{p}} \leq X^S \qquad (*)$$

- The good entrepreneur prefers to invest if his project's NPV exceeds the discount:

$$V(p_G) \geq (p_G - \widehat{p}) R_0^H$$

- The bad entrepreneurs prefers to invest if the sum of his project's (negative) NPV and premium is positive:

$$\begin{aligned} V(p_B) - (p_B - \widehat{p}) R_0^S &\geq 0 \qquad (**) \\ &\Longleftrightarrow \\ V(p_G) &\geq (p_G - \widehat{p}) R_0^S + \frac{\Delta p}{p_B} A \end{aligned}$$

which is stronger than the condition for the good entrepreneur.

- In the pooling PBE where both types invest, the good entrepreneur also has to prefers R_0^S to any other R^S that allows him to raise at least $I - A$. This requires that the discount on R_0^S is not larger than the discount on any other R^S. Setting $\nu(R^S) = 0$ for all $R^S \neq R_0^S$ ensures that this condition is satisfied, i.e.,

$$(p_G - \widehat{p})R_0^S \leq (p_G - p_B)\,\frac{I - A}{p_B}$$

That is

$$R_0^S \leq \frac{I - A}{(1 - \nu)p_B} \equiv R_{0_{\max}}^S$$

$R_{0_{\max}}^S > R_{0_{\min}}^S$ always.

- Hence, for a separating equilibrium to exist there are two necessary and sufficient conditions:
  - First, (*)
  - Second, from (**) and the requirement that $R_0^S \leq X^S$:

$$\frac{V(p_B)}{p_B - \widehat{p}} \leq \min\{X^S, R_{0_{\max}}^S\}$$

- Skipping derivation the two conditions lead to:

$$V(p_B) \geq \max\left\{-\nu\Delta p X^S,\ -\nu\Delta p\frac{I - A}{(1 - \nu)p_B}\right\}$$

To Summarize

- Separating Equilibrium with Only the Good Type Investing:

$$V(p_G) \leq \frac{\Delta p}{p_B} A \quad \text{or} \quad V(p_B) \leq -\frac{\Delta p}{p_G}(I - A)$$

- Pooling Equilibrium with No Type Investing:

$$V(p_G) \leq \frac{\Delta p}{p_B}(I - A) \quad \text{or} \quad V(p_B) \leq -\frac{\Delta p}{p_G} A$$

- Pooling Equilibrium with Both Types Investing:

$$V(p_B) \geq \max\left\{-\nu \Delta p X^H,\ -\nu \Delta p \frac{I - A}{(1-\nu)p_B}\right\}$$

Remarks:

- An equilibrium always exists.
- There may be multiple equilibria.
  - Both pooling and separating equilibria may exist
  - There may be a continuum of e.g. separating equilibria
- Multiplicity may be eliminated by refinements that put restrictions on beliefs following an out-of-equilibrium move.

An Illustration

Assumption: $A = 0$, hence only pooling equilibria exist.

Suppose that the good type could choose the equilibrium to be played. He would then choose $R^S = 0$ or $R^S = \frac{I}{\widehat{p}}$

$$\begin{cases} \min \quad R^S \\ \text{s.t.} \\ \qquad \widehat{p}R^S \geq I \quad \text{(F) Feasibility} \\ \qquad R^S \leq X^S \quad \text{(LL) Limited Liability} \end{cases}$$

- **Market breakdown (underinvestment):**

Suppose that the average value is negative, i.e.,

$$\widehat{p}X^S - I < 0$$

Then credit rationing: neither type of project is undertaken.

Indeed, there is no feasible repayment (i.e., $R^S \leq X^S$) such that investors can expect to break even as

$$p_G(X^S - \frac{I}{\widehat{p}}) < 0$$

The subsidy to bad projects is too high for good ones to be viable. Hence, the capital market breaks down.

This is simple application of Akerlof's **lemon's problem**: Gains from trade may not materialise in markets plagued by adverse selection.

Necessary condition for market break-down: $V(p_B) < 0$

- **Overinvestment:**

Suppose that the bad project's value is negative, i.e.,

$$p_B X^S - I < 0$$

but the average value is positive, i.e.,

$$\widehat{p} X^S - I > 0$$

Then both types of projects are financed. Indeed, good entrepreneurs make a profit despite the discount on claims:

$$p_G(X^S - R^S) = p_G(X^S - \frac{I}{\widehat{p}}) > 0$$

Bad entrepreneurs make a profit despite NPV < 0

$$p_B(X^S - R^S) = p_B(X^S - \frac{I}{\widehat{p}}) > 0$$

Bad firms "pool" with good firms and get financed.

Mitigating Information Asymmetry Problems

Internal Funds:

- Suppose that the entrepreneur has $A > I$
- No credit rationing: Good projects that could not be financed externally can be undertaken.
- No bad projects financed: Good entrepreneurs prefer to self-finance because external finance is more expensive (i.e., claims are sold at a discount) due to pooling by bad entrepreneurs.

Information Insensitive Assets:

- Suppose that the entrepreneur has an asset worth $A > I$ about which there is no information asymmetry
- Claims on this asset are sold at their fair price, i.e., no discount
- Thus the entrepreneur can finance the project

Reducing the Informational Gap:

To convey his type to investors, a good entrepreneur is willing to pay up to $\min\left\{(p_G - \widehat{p})\frac{I}{\widehat{p}}\ ;\ V(p_G)\right\}$

- **Monitoring/Certification:** by a bank, venture capitalist, auditor, etc.
- **Issuing claims that are least sensitive to information** (e.g. debt)
- **Signalling:** debt, collateral, dividend payments, IPO under-pricing, etc.