Theory of Corporate Finance
Information and Financial Markets

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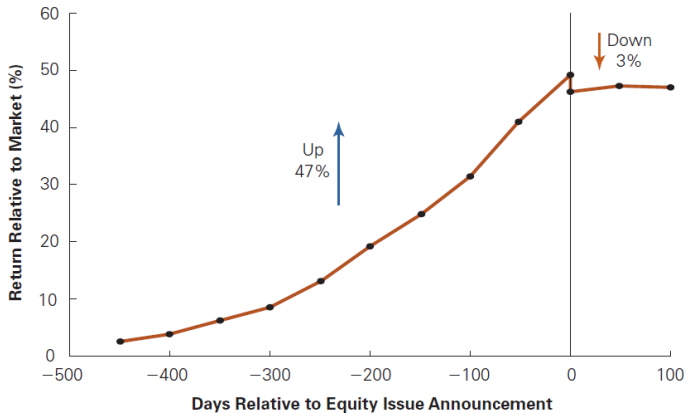
Stylized Facts

- **SEO: seasoned equity offerings**



- Negative stock announcement effect (Lucas-McDonald, JF1990)
- By contrast, there is no significant stock price reaction upon debt issuance annuncement.
- The primary source of financing for mature firms is retention / internal funds.
- External financing is mainly debt financing.

Leland and Pyle (1977): Setup

- Capital markets have **asymmetric information:** there are good and bad firms, but hard to know.
  - The market interprets capital structure choice as a signal of good/bad firms.
  - Leland and Pyle (1977) and Ross (1977): earliest finance works that apply the idea of signaling.
- LP(1977) setup: A risk-averse manager has a project that pays $x = \theta + \varepsilon$ at time 1, where $\varepsilon \sim \mathcal{N}(0, \sigma^2)$ is noise.
- At time 0, the manager sells a fraction $1 - \alpha$ of the project to diversify risks.
  - Manager retains a fraction α of the project.
- While the manager privately observes the project type θ, the market perceives $\theta \in [\underline{\theta}, \bar{\theta}]$.
  - Retention is a signal about the project type: $\alpha \mapsto \theta(\alpha)$.
  - Project (firm) valuation by uninformed investors: $V(\alpha) = \theta(\alpha)$.

Leland and Pyle (1977): Managerial Risk Aversion

- Manager's expected utility:

$$\mathbb{E}[u(W)|\theta] = \mathbb{E}(W) - \frac{\gamma}{2}\text{Var}(W)$$

where γ is the coefficient of absolute risk aversion; and the wealth at time 1 is:

$$W = \alpha x + (1-\alpha)V(\alpha)$$

where α is the fraction of project retained and $(1-\alpha)V(\alpha)$ is the fund raised by selling a fraction of $1-\alpha$ equity at time 0.

- Then the manager chooses α to maximize:

$$\alpha\theta + (1-\alpha)\theta(\alpha) - \frac{\gamma}{2}\alpha^2\sigma^2$$

given the market's belief $\theta(\alpha)$.

Equilibrium

- Symmetric information benchmark: the market knows θ: $\theta(\alpha) = \theta$ for any α. So, $\alpha^{FB} = 0 \in \arg\max_\alpha \theta - \frac{\gamma}{2}\alpha^2\sigma^2$ for any θ
  - Intuition: efficient to offload all project risk to the market
- Now, back to asymmetric information. Let $\alpha^*(\theta)$ be the type-θ manager's retention strategy. Focus on separating equilibrium

$$\theta(\alpha^*(\theta)) = \theta \tag{1}$$

- First-order condition: given $\theta(\alpha)$, $\alpha^*(\theta)$ must solve

$$\theta - \theta(\alpha^*) + (1 - \alpha^*)\theta'(\alpha^*) = \gamma\alpha^*\sigma^2 \tag{2}$$

- You should know the meaning of a **Perfect Bayesian equilibrium (PBE)**

Characterization

- Under the market belief (1), FOC becomes

$$\underbrace{\theta - \theta(\alpha^*)}_{=0} + (1-\alpha^*)\theta'(\alpha^*) = \gamma\alpha^*\sigma^2$$

- $\theta'(\alpha) = \frac{\alpha\gamma\sigma^2}{1-\alpha} > 0$: high retention signals a good project; and good types retains more shares.
- The solution to the first-order differential equation:

$$\theta(\alpha) = -\gamma\sigma^2(\log(1-\alpha)+\alpha) + C$$

  where the constant C is pinned down by a boundary condition $\theta(0) = \underline{\theta} \Rightarrow C = \underline{\theta}$: the worst type retains no equity.
- What is the signaling cost and who bears it?

Myers-Majluf (1984)

- It illustrates the cost of equity financing.
- Firms may refuse to issue stock and pass up valuable investment opportunities.
- It provides explanations of firms' tendency to rely on internal funds, and to prefer debt to equity if external financing is required.
- The economic mechanism is quite similar to Akerlof (1970) which shows that markets can break down due to the lemon's problem.

Myers-Majluf (1984): Setup

- Players: manager, existing shareholders and the market (new shareholders), all risk neutral.
- A firm has assets-in-place that worth $\tilde{a}$ and a project that requires a capital investment of I has the NPV of $\tilde{b}$:
  - The firm has a financial slack of S (cash, marketable securities...).
- The manager privately observes (a, b) and acts in the best interest of the *existing shareholders.*
- Assume $S < I$, implying that internal financing is not enough for the project investment.
- Only equity can be issued to finance the investment.
  - The necessary funds need to be raised from new equity is $E = I - S$.

Strategies and Equilibrium

- The manager's strategy is to decide whether to *issue stock and undertake the project* or not *in each state*.
- The market forms a *belief* of the state of the world; and adopts a strategy to *price the share values*.
- Seach for the Perfect Bayesian Equilibrium.
- Refer to Section 2 of the paper for an illustrating Example.

When Will the Manager Issue Equity?

- From the manager's perspective the firm value is
  - No investment: $V_o = a + S$;
  - Issue & invest: $V_I = a + S + b + E = a + b + I$.
- $M = \{(a, b) : \textit{issue\&invest}\}$; $p' = \mathbb{E}\left[\tilde{a} + \tilde{b} + S | M\right]$;
- The fraction $1 - \alpha$ of equity sold to new shareholders:

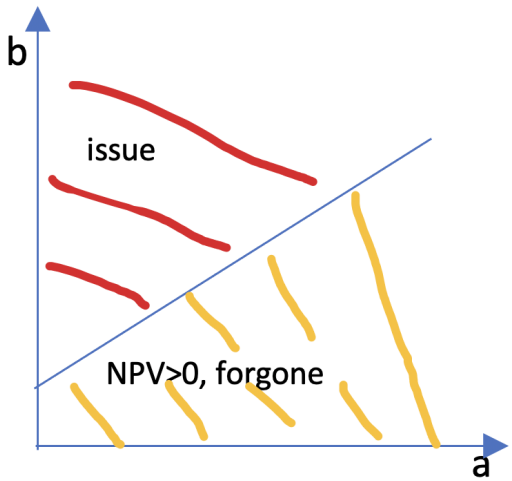
$$1 - \alpha = \frac{E}{E + p'}$$

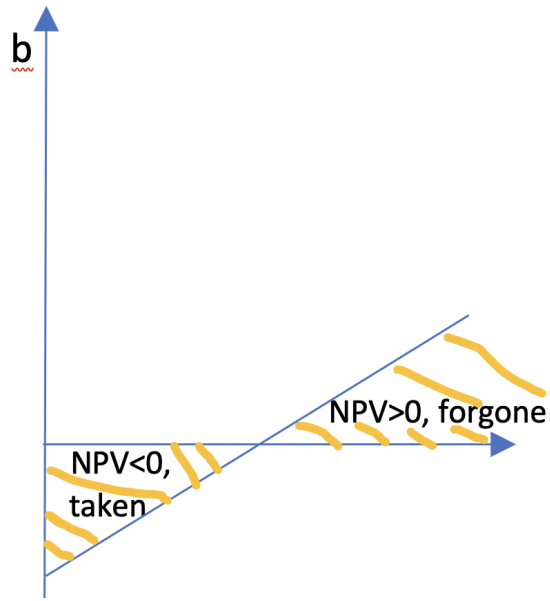
- Manager sells the fraction, $(a, b) \in M$, if and only if

$$\underset{\text{issue}}{\alpha(a + b + I)} \geq \underset{\text{not isse}}{a + S} \Leftrightarrow b \geq \frac{1 - \alpha}{\alpha} \cdot a + \frac{S}{\alpha} - I$$

Equity Issuance: Inefficiencies

- Firms with a high asset value may forgo a project with positive NPV.
- Firms with a low asset value may issue equity to finance a project with negative NPV.





Asymmetric Information Drives Equity Under-pricing

- With symmetric information, $(1-\alpha^{FB})(a+b+I) = I - S$, and so

$$1-\alpha = \frac{I-S}{\mathbb{E}\left[\tilde{a}+b\tilde{+}I|M\right]} \lessgtr 1-\alpha^{FB} = \frac{I-S}{a+b+I} \Leftrightarrow \mathbb{E}\left[\tilde{a}+\tilde{b}|M\right] \gtrless a+b$$

  - When a type-(a,b) firm is under-valued by the market, equity sold is more than what would have been in a symmetric information world.
  - Myers-Majluf (1984): Equity may be under-priced by the market, and difficult to sell, in the presence of private information.

Pecking Order Theory

- What about debt financing? Debt with face value F.
- How is the debt priced for different firms?
  - The firm needs to have $I - S$ today, so find a face value F such that $D(F) = I - S$;
  - Debt is insensitive to information: the repayment is (mostly) independent of asset's cash flows.
- So good firms issue less information-sensitive security to avoid under-pricing.
- Financing pecking order: cash $>$ debt $>$ equity.

Critics

- Though the pecking-order hypothesis received substantial emipircal support and is a good starting point for the analysis, the thoery does face some critics.
- Cash-poor firms' viability concerns seriously limit their demand for debt financing.
- The entrepreneurs' and large investors' exit strategies require issuing equity.
- Small, high-growth firms do not behave at all according to the pecking-order hypothesis, even though these firms are fraught with asymmetric information. (Frank and Goyal, 2003)

Gorton and Pennacchi (1990): The Setting

- Three periods: $t = 0, 1, 2$; one consumption good and one capital good (\$).
- Technology: \$1 invested at $t = 0$ produces an asset at $t = 1$.
  - prob. λ the asset is a lemon; payoff (of consumption good) R_L at $t = 2$;
  - prob. $1 - \lambda$ the asset is good; payoff (of consumption good) $R_H > R_L$ at $t = 2$.
- Traders have \$1 endowment at $t = 0$.
  - a fraction α of liquidity (early) traders: $u(c_1, c_2) = c_1$;
  - a fraction $1 - \alpha$ of informed (late) traders: $u(c_1, c_2) = c_2$.
- Long-term investors have a lot of consumption good endowment at $t = 1$, and $u(c_1, c_2) = c_1 + c_2$.
- Only the informed traders know the asset type.
- Diamond-Dybvig's (1983) flavor: liquidity traders need to sell the asset at $t = 1$.

Benchmarks

- **Full information benchmark:** everyone knows the asset type.
  - Equilibrium: traders invest at $t = 0$. At $t = 1$, liquidity traders sell to long-term investors.
  - Asset price is R_L if bad and R_H if good. So, liquidity traders have utility $\mathbb{E}(R) = \lambda R_L + (1 - \lambda) R_H$
- **Ignorance benchmark:** no one knows the asset type.
  - Liquidity traders sell to long-term investors
  - But the investors only pay $\mathbb{E}(R) = \lambda R_L + (1 - \lambda) R_H$
- Lesson: Liquidity traders get the same utility in both cases; ignorance is a bliss for market liquidity

A Lemon Equilibrium with Asymmetric Information

- Now, only the informed traders observe the asset type.
- Consider $t = 1$ market price for assets p.
  - Liquidity traders sell all assets;
  - Informed traders sell only bad assets, because $p \in (R_L, R_H)$.
- So, the fraction of lemons being traded $\lambda_m = \frac{\lambda}{\alpha+(1-\alpha)\lambda} > \lambda$.
  - Competitive long-term investors need to break-even:

$$\begin{aligned} p =& \lambda_m R_L + (1-\lambda_m) R_H \\ =& \underbrace{\mathbb{E}(R)}_{\text{fair price}} - \underbrace{(\lambda_m - \lambda)(R_H - R_L)}_{\text{lemon's disount}} \end{aligned}$$

- Informed traders benefit from private information at the expense of liquidity traders; private information hurts market liquidity.
  - Return of informed: $\lambda p + (1-\lambda) R_H = \mathbb{E}(R) + \lambda(p - R_L) > \mathbb{E}(R)$;
  - Return of liquidity traders: $p < \mathbb{E}(R)$.

Debt Security Creates Liquidity

- Key point of Gorton-Pennacchi (1990) is a financial intermediary or a firm can create debt and equity to improve market liquidity.
- Say a bank invests on behalf of the agents and issues debt and equity:
  - Safe debt with face value $d \leq R_L$, held by liquidity traders;
  - Equity with payoff $\max\{R-d, 0\}$, held by informed investors.
- A risk-free debt claim creates liquidity because its cash flow is state-independent.
- **No lemon discount:** at $t = 1$, the market always prices the debt at d.

When Will the Agents Participate?

- Let x be the price of debt. Liquidity trader's returns must be

$$\underset{\text{intermediary}}{d/x} \geq \underset{\text{lemon eqm.}}{p} \Rightarrow x \leq \frac{d}{p}$$

  Note that $x \leq \frac{d}{p} < 1$ because $d \leq R_L < p$

- The remaining capital, $1-x$, must be contributed by the informed traders in exchange for the equity tranche. Informed trader's returns need to satisfy

$$\underset{\text{intermediary}}{\frac{\mathbb{E}[\max\{R-d,0\}]}{1-x}} \geq \underset{\text{lemon eqm.}}{\mathbb{E}(R) + \lambda(p - R_L)} \tag{3}$$

- Key question: is there a $d \leq R_L$ such that condition (3) is satisfied?
- What is the p now?

Intermediary Equilibrium

- Suppose α is small and that $\alpha\mathbb{E}(R) < R_L$. Consider the following equilibrium:
  - Liquidity traders pay $x = \alpha$ for debt claims with face value $d = \alpha\mathbb{E}(R)$;
  - Informed traders pay $1 - \alpha$ to hold the equity tranche; otherwise they directly invest into the asset.
- The market at $t = 1$:
  - Safe debt claims: sold to the market at price d.
  - Anyone selling the asset must be the informed. Asset price $p = R_L$.
- Both liquidity and informed traders will participate because they both get the return $\mathbb{E}(R)$.
- More importantly, liquidity holder gets the same as the full information case.

General Messages from Gorton-Pennacchi (1990)?

- Debt provides a safe transaction medium and shields liquidity traders from informed traders.
  - Debt is preferred by investors with future liquidity needs.
  - Information insensitivity of debt is a key to its market liquidity.
  - High turnover in safe securities (treasuries and bank liabilities).

Comments

- Information cannot be transmitted in a credible way.
- Generally, security issurance, stock repurchases, dividend payouts, etc., can be viewed as informative signal.
- Debt security is informationally insensitive most of the times, and helps creating liquidity.