Theory of Corporate Finance: PS1

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1. Consider a one-period model of debt overhang. Suppose a firm has assets-in-place that pays x_g or x_b at time 1, with equal probability. Assume $x_g > F > x_b$, where F is the face value of debt to be repaid at time 1. Let interest rate be 0.

   (a) What are the time-0 market values of the debt, equity, and the firm?

   (b) Suppose the firm has a project that costs I at time 0. If the firm invests, the project pays $R > I$ for sure at time 1. Suppose $F > x_b + R$ and the equity holders have the decision rights regarding the investment decision, and they finance the investment cost entirely. If the equity holders invest, what are the time-0 equity value, debt value, and the firm value?

   (c) From the values of corporate securities you worked out in part (a) and (b), under what conditions on the project characteristics will equity not invest? Why underinvestment can occur?

   Assume the conditions you found in (c). Suppose now the equity holders can renegotiate with the debt holders at time 0 before they make the investment decisions. In particular, equity holders can propose a new face value $F^* < F$. If debt holders reject the proposal, negotiation breaks down and the face value is still F.

   (d) Intuitively explain what debt holders gain and lose from accepting the new proposal. How about the equity holders?

   (e) What are the possible values of the new face value F^* will equity propose and will debt accept? Following this idea, can debt overhang problem be resolved?

2. A firm needs to raise I dollars to invest in a project that generates a certain return of 1 dollar, where $I < 1$. The firm has an asset-in-place that worth θ. The value of this asset is private information of the firm (or its founder/manager), and the competitive capital market believes that θ is distributed uniformly on $[0, 1]$. Assuming the firm can only use equity financing, and the manger maximizes the payoff of existing shareholders.

(a) Suppose now that all firms finance the project by selling a new share $s \in (0, 1)$. Following Myers and Majluf (1984), derive the share issurance s.

(b) What is the existing shareholder's payoff if the manager chooses to issue the new share? what if the manager chooses not to issue?

(c) Which firms will optimally forego the positive NPV project? Give a simple condition that illustrates your result. Explain briefly the logic behind it.

(d) For $I = 4/5$, which types of firm will issue/invest and which types will not?

(e) Derive a condition under which the manager will always issue new shares and invest regardless of the true θ.

3. Show results one to four listed in the class slides that illustrate Townsend (1979).