# Corporate Finance - Yossi Spiegel

## Problem set 2

Problem 1

This question is a variant of the model that appears in "Entrepreneurial Moral Hazard and Bank Monitoring: A Model of the Credit Channel," by Repullo and Suarez (*EER*, 2000, p. 1931-1950).

An entrepreneur establishes a firm at date 0. The firm has only one project that requires an investment of 1 and yields in date 1 a cash flow $Y > 1$ with probability $p$ and 0 with probability $1-p$. Apart from monetary payoffs, the manager also gets private benefits, $Y(1-p^2)$, from running the project. At date 0 when the firm is established, the entrepreneur can choose the value of $p$ (a higher $p$ means a higher probability of success but lowers the direct utility from running the project). The entrepreneur's objective is to maximize his expected utility that includes the expected cash flow from the project and his direct utility from running it.

(a)     Suppose that the entrepreneur finances the investment in the project with his own money. Solve for the value of $p$ that the entrepreneur will choose and compute his expected utility at the optimum.

(b)     Now, suppose that the entrepreneur finances the investment by issuing debt with face value D in a competitive capital market. Debt is backed by a collateral worth K: if debtholders are not paid in full in date 1 (this occurs with probability $1-p$), they seize the collateral. Compute the value of D for a given $p$, assuming that debtholders can earn a return r on their money elsewhere (i.e., r is the interest rate).

(c)     Solve for the value of $p$ that maximizes the entrepreneur's expected payoff. (Recall that with probability $p$, the project succeeds and the entrepreneur's receives Y-D at date 1 and with probability $1-p$ it fails and the entrepreneur forfeits the collateral which is worth K. In addition, the entrepreneur gets private benefits in date 0). Compare your answer with (a) and explain the intuition in detail.

(d)     Given your answers in (b) and (c), compute the value of D. (Note that since $p$ depends o D, D will appear on both sides of the condition you found in (b). Also note that your answer will involve a quadratic equation; choose the smaller root of this equation (why?))

(e)     Suppose that K < 1+r. How is the value of D that you found in (d) affected by changes in K? Explain the intuition for this result.

Problem 2

The following question is based on the paper "Managerial Discretion and Optimal Financing Policies," by Stulz (*JFE*, 1990).

A firm is established in date 0 and operates in periods 1 and 2. In period 1, the firm's earnings are given by a random variable $\tilde{X}$ distributed on $[0, X]$ according to a cumulative distribution function $F(\tilde{X})$. The mean earnings in period 1 are $\hat{X}$. The firm's manager prefers to invest all the period 1 earnings in a project (i.e., the manager has a preference for "empire building"). If the manager invests I dollars in period 1, the firm's earnings in period 2 are equal to $z_1 I$ if $I \leq I^*$, and $z_1 I^* + z_2(I-I^*)$ if $I > I^*$, where $I^* < X$ and $z_1 > 1 > z_2$ (i.e., investment is profitable up to $I^*$ and wasteful otherwise). For simplicity, assume that all investors are risk neutral and that the discount rate is equal to 0.

(a)     Suppose that the manager is operating on behalf of shareholders and invests optimally in period 1. In addition, suppose that the firm can raise external funds in the capital market in period 1 after $\tilde{X}$ is realized but before investment is made. Write out the market value of the firm in period 0 given these assumptions, and denote it by $V^{fb}$.

(b)     Suppose that the firm cannot raise external funds in period 1. Write out the market value of the firm in period 0 and denote it by V. Carefully explain the meaning of this expression (i.e., what do the different components of this expression represent?).

(c)     Rewrite V as a function of $V^{fb}$ and identify two types of distortions: one due to underinvestment and one due to overinvestment.

(d)     Now suppose that in period 1, before investment is made, the existing shareholders (not the manager!) can decide to raise N dollars by issuing new equity that represents a fraction $\alpha$ the total equity of the firm. When they choose N, the existing shareholders ,as well as new equityholders, do not observe $\tilde{X}$, but they know that the manger will invest all the funds that the firm has in the project. Write out the expected earnings of the firm in period 2 and denote it by Y. Using this expression, write out the equilibrium condition in the capital market that determines the fraction $\alpha$ of the firm's equity such that the firm will raise N dollars from new equityholders.

(e)     Given your answer in (d), write out the value of the existing shareholders as a function 2 of N and denote it by V(N). Write out the first order condition for the value of N, N*, that maximizes V(N), assuming that N* > 0, and carefully explain the meaning of this condition. What is the condition that ensures that N* > 0? What is the intuition for this condition? How is this condition affected by changes in $z_1$ and $z_2$? Explain why.

(f)     Now suppose that in period 0, the existing shareholders (again, not the manager) can decide to issue debt with face value D that becomes due in period 1 before investment is made. If $\tilde{X} < D$, the firm is liquidated and debtholders are the residual claimants. If $\tilde{X} \leq$ D, the firm remains solvent, debtholders receive D dollars and the manager invests $\tilde{X}$ -D

dollars. Write out the market value of debt, B(D), the market value of equity, E(D), and the market value of the firm V(D).

(g)     Write out the first order condition for the value of D, D*, that maximizes V(D), assuming that D* > 0, and carefully explain the meaning of this condition. What is the condition that ensures that D* > 0? What is the intuition for this condition? How is it related to the condition you found in (e)? Explain the intuition for this.


Problem 3

Consider the following variant of the Myers (1977) model. A firm is established at date 0 and possibly issues debt. At date 1, the firm can invest I dollars that yield $X + 2zI^{1/2}$ at date 2, where X is a positive constant, z is a random variable distributed uniformly on the unit interval, and $I \in [0, 1]$ is a choice variable (this is unlike in the original Myers model where I is given and the firm can either decide to invest or not invest but cannot choose the size of its investment). Assume that at date 0 when it is just established, the firm only knows that distribution of z but that at date 1 before it invests, the firm knows the exact realization of z (and hence its cash flow if it invests). If the firm does not invest at date 1, then its cash flow at date 2 is X.

(a)     Suppose that the firm is all-equity. Describe the optimal investment decision for the firm as a function of z, and compute the market value of the firm at date 0.

(b)     Now suppose that at date 0, the firm issues <u>long-term</u> debt which becomes due at the end of date 2. Note that since investment can take place only in date 1, debtholders cannot invest if the firm goes bankrupt in date 2. For a given value of D, compute the critical level of z, denoted z*, above which the firm will decide to invest and compute the level of its investment.

(c)     Given z*, write the market values of equity, E, debt, B, and the firm, V at period 0.

(d)     Compare V with the market value of an all-equity firm and explain your answer.


Problem 4

Carefully read the paper "Information Problems, Conflicts of Interest, and Asset Stripping: Chapter 11's Failure in the Case of Eastern Airlines," by Weiss and Wruck (*Journal of Financial Economics,* Vol. 48, 1998, pp. 55-97) and answer the following questions.

(a)     What led to Eastern Airlines bankruptcy in March 1989?

(b)     Why did Eastern Airlines chose to file for bankruptcy in New York?

(c)     What was the value lost during Chapter 11?

(d)     What is the evidence for asset stripping? How much value was lost?

(e)     Summarize briefly the agency conflicts between Frank Lorenzo and labor unions and between secured and unsecured creditors.

(f)     Briefly describe the effect of the trustee's (Martin Shugrue) actions on Eastern Airlines' value.

(g)     How were Eastern Airlines' competitors affected by its attempts to reorganize?

(h)     How did Eastern Airlines fare relative to its competitors? What is the evidence that it did worse than average?