Assignment #2 for **Managerial Economics**
Fall 2017

Due date: Mon. Oct. 2.

Readings: Klein et al. Ch. 1.

A. Some definitional questions.
   1. Explain the difference between a secured creditor and a general creditor.
   2. Explain how a non-recourse loan for capital to invest in a business limits a sole proprietor's personal liability.
   3. A bank loans \$15,000 to the sole proprietor of a business at an interest rate of %8, and unexpectedly, a competitor goes out of business. Explain the subsequent divergence between the book value and market of the bank's note.

B. A sole proprietor invests \$120,000 in a small business, \$80,000 of their own money and \$40,000 borrowed from a bank at a %10 rate of interest (so that \$4,000 must be paid to the bank at the end of the fiscal year).
   1. If, net after all expenses and allowances, including a reasonable amount for her own services but before interest payments, the sole proprietor makes a fiscal year profit of \$18,000 (or a %15 rate of return on investment). What is the proprietor's rate of return on her own investment?
   2. If, net after all expenses and allowances, including a reasonable amount for her own services but before interest payments, the sole proprietor makes a fiscal year profit of \$6,000 (or a %5 rate of return on investment). What is the proprietor's rate of return on her investment?
   3. Give the word used to describe the financial consequences of the use of debt and equity that you have just found.

C. For this problem, suppose that, R, the rate of return on money invested in a firm has a uniform distribution over the interval $[0.8, 1.6]$. The firm is financed using D in debt, in the form of a non-recourse loan, and E in equity. At the end of the year, payment due on D is $0.08 \cdot D$. This must be paid out of the total returns, $R \cdot [D + E]$.
   1. Give the expected value (mean), variance and standard deviation of total returns, $E\, R \cdot [D + E]$, and of the entrepreneur's profits, $E\,(R \cdot [D + E] - 0.08D)$.
   2. Give the expected value (mean), variance and standard deviation of the entrepreneur's rate of return on equity, $E\,(R \cdot [D + E] - 0.08D)/E$.

D. The "mean-variance" preferences are a very simple way to represent the utility of various risky options. Facing the random variable X, utility is given by

$$U(X) = E\,X - \lambda \mathrm{Var}\,(X)$$

where $\lambda > 0$ is a measure of the sensitivity to variance/risk.

Give the cdfs, the means, the variances, and, as a function of $\lambda > 0$, the utility of the following random variables.
   1. X is uniformly distributed on the interval $[0.5, 1.7]$.
   2. X' is equal to -0.2 with probability 0.05, and is uniformly distributed on the interval $[0.5, 1.7]$ with probability 0.95.

3. Y is uniformly distributed on the interval $[0.7, 1.9]$.
4. Y' is equal to -0.2 with probability 0.05, and is uniformly distributed on the interval $[0.7, 1.9]$ with probability 0.95.
5. Z is uniformly distributed on the interval $[0.3, 1.9]$.
6. Z' is equal to -0.2 with probability 0.05, and is uniformly distributed on the interval $[0.3, 1.9]$ with probability 0.95.
7. R is uniformly distributed on the interval $[-2, 6]$.
8. $S = \max(0, R)$, that is, S has the cdf

$$F_S(x) = \begin{cases} 0 & \text{if } x < 0 \\ \frac{1}{4} + \frac{x}{8} & \text{if } 0 \leq x \leq 6. \end{cases}$$

E. Before the invention of LLC's (limited liability corporations), it was possible to lose more than one's investment in the firm. This problem provides a comparison of the incentives to invest before and after.

Suppose that R is uniformly distributed on the interval $[-1, 4]$ and that $S = \max(0, R)$, that is,

$$S = \begin{cases} 0 & \text{if } R \leq 0 \\ R & \text{if } 0 < R \end{cases}.$$

Having wealth w, an investor with mean-variance preferences and risk sensitivity λ is looking at investing x into the firm, $0 \leq x \leq w$. Let $x_R^*(\lambda)$ be the solution to

$$\max_{0 \leq x \leq w} E\left[(w - x) + Rx\right] - \lambda \text{Var}\left((w - x) + Rx\right),$$

and let $x_S^*(\lambda)$ be the solution to

$$\max_{0 \leq x \leq w} E\left[(w - x) + Sx\right] - \lambda \text{Var}\left((w - x) + Sx\right).$$

1. For $\lambda' > \lambda$, which is larger, $x_R^*(\lambda')$ or $x_R^*(\lambda)$? Give both a mathematical and an economic argument for your answer.
2. For $\lambda' > \lambda$, which is larger, $x_S^*(\lambda')$ or $x_S^*(\lambda)$? Give both a mathematical and an economic argument for your answer.
3. For fixed $\lambda > 0$, which is larger, $x_R^*(\lambda)$ or $x_S^*(\lambda)$? Give both a mathematical and an economic argument for your answer.

F. Suppose that the probability of loss $L = 100,000$ from self-dealing behavior by a manager can be reduced at a monitoring cost of c, specifically, that $P(c) = \gamma \cdot e^{-c}$ where $\gamma = 0.2$ and c is measured in units of thousands of dollars. The problem is how large a cost to incur while trading off losses and monitoring costs.

1. Give three examples of what the textbook calls "self-dealing."
2. How do the legal structures of duty of loyalty/fiduciary obligations treat self-dealing?
3. Solve the monitoring problem, that is, solve

$$V(\gamma, L) = \min_{c \geq 0} \left(L \cdot \gamma \cdot e^{-c} + c\right)$$

and give optimal probability of loss as a function of L and γ.

4. If $V(\gamma, L)$ above is too large, it may not be profitable to run the firm using a manager who might self-deal. What kind(s) of solutions does the textbook

propose? How do the problems (above) on risk and leverage enter into their feasibility?

5. Suppose that the background probability of loss decreases from γ to $\gamma' = 0.1$. What happens to the optimal c? To the optimal probability of loss? Give both a mathematical and an economic argument for your answer.
6. Suppose that the size of loss increases for $L = 100,000$ to $L' = 150,000$. What happens to the optimal c? To the optimal probability of loss? Give both a mathematical and an economic argument for your answer.
7. Returning to first problem (with $\gamma = 0.2$ and $L = 100,000$), suppose that the company has its employees bonded, that is, suppose the company buys complete insurance, at a price p, against their self-dealing. What does this insurance purchase do to the solution to the problem in part F3? [This is an example of what is called "moral hazard."]
8. Suppose now that the insurance contract specifies that the losses will not be made good if the company exerts a care level less than c°. Give the set of prices p and care levels c° that make both the insurance company and the firm happy with the contract.

G. An employee causes a car accident while on company business.

1. Who is liable? The employee or the company? What is the name of the legal doctrine behind your answer?
2. What market insurance purchase decisions does this affect?
3. How might moral hazard enter into your answer?
4. What kinds of legal structures might the insurance company use to manage this moral hazard?