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**Economics of the Firm**  
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**Suggested Solutions to Practice Questions for Chapters 1,2**

**Chapter 1:**

- 1) Principle-agent problems arise when two parties in a transaction have potential conflicts with their objectives. For example, if you buy car insurance, you (the agent) and the car insurance company (the principal) have potentially different incentives – i.e. you like to drive fast while the insurance company wants you to drive safe! There are two solutions to this problem: The first is monitoring (i.e. the insurance company follows you around to make sure you are driving safe). Monitoring is often times very expensive, so the more efficient solution is *optimal contracting*. That is, write a contract that better aligns the incentives of the parties involved. In the case of insurance, a car insurance policy has a deductible. Now, with the driver sharing some of the cost of the accident, he has more of an incentive to drive safely.

In the case of a corporation, the stockholders (principal) and the managers (agents) potentially have different objectives: The shareholders are interested in maximizing the value of their stock while the managers might only be interested in playing golf and collecting a nice salary. Specifically, there might be the following potential conflicts:

- The Effort Problem: It is often difficult to observe the effort put in by the manager. Often, low manager effort is reflected in poor company performance, but a company can also be hit with bad luck.
- The Horizon Problem: The value of a company's stock is affected by forecasts of performance far out into the future (i.e. a company has an infinite lifetime). A manager might have a much shorter time horizon (i.e. the number of years until retirement) when evaluating projects.
- Differential Risk Problem: The manager might have a lot less to lose if the company performs badly.

As with insurance, this principal-agent problem could be solved with monitoring, but that can be costly and impractical. Therefore, the alternative (optimal contracting) involves choosing a combination of salary and performance based pay to better align the incentives of the shareholders and the managers. A compensation plan with an emphasis

on salary tends to give the manager the incentive to “play it safe” and do not help with the effort problem. Bonuses help with the effort problem, but can exacerbate the horizon problem (if bonuses are based on short term performance). Longer term incentives such as stock options help the effort problem, the horizon problem, and the differential risk problem, but because the manager is now faced with a lot of risk in his/her salary that is potentially out of his/her control, average compensation will have to be higher to make up for this added risk.

- 3) Perhaps the politicians have a point. In general, as an industry becomes more profitable, new companies should be entering the market. As new companies enter, and supplies increase, the price and industry profits should fall to normal levels. However, the oil industry has significant barriers to entry and can prevent entry (if entry is possible at all). This would be an example of the monopoly theory of profit.

On the other hand, you could argue that this is simply a temporary disequilibrium in the oil market and that while the oil industry is temporarily earning excessive profits, profits will fall once the unusual circumstances have ended.

- 5) Recall that a firm’s value is based off the present value of lifetime profits:
- a) New competitors in the market should increase the supply and lower the price. A lower price should lower profit margins and, hence, lower firm value.
  - b) Strict pollution controls will restrict production options and, more than likely, raise production costs. Value should drop.
  - c) A unionized labor force will raise labor costs and should lower firm value.
  - d) An increase in the rate of inflation is somewhat ambiguous. In principle, it should have no effect on profit margins in that it will raise production costs as well as revenues. Additionally, a higher inflation rate will be reflected in a higher interest rate used to discount future profits.
  - e) A major technological breakthrough that reduces production costs should increase profit margins and raise firm value.

## Chapter 2:

1) First, let's rank the projects by rate of return:

Project	Cost	Return
A	500	23%
C	50	21%
G	250	19%
B	75	18%
D	125	16%
E	300	14%
F	150	13%

Now, we will continue to invest in projects as long as the marginal return is greater or equal to the marginal cost:

Project A: MB = 23%, MC = 15.5%

Project A+C: MB = 21%, MC = 16%

Project A + C + G: MB = 19%, MC = 16.5%

Project A + C + G + B: MB = 18%, MC = 18%

Project A + C + G + B + D: MB = 16%, MC = 18%

Project D at the margin costs more than the benefit, so we stop with project B and spend \$875M on projects A,C,G, and B.

2) So, we have the following:

Event	Expansion	Normal	Recession
Probability	.2	.5	.3
Sales	\$90M	\$85M	\$75M

a) To calculate expected value, multiply each outcome by it's probability and then add them up:

$$EV = (.2)(90) + (.5)(85) + (.3)(75) = \$83M$$

b) Next, calculate standard deviation:

$$SD = \sqrt{(.2)(90 - 83)^2 + (.5)(85 - 83)^2 + (.3)(75 - 83)^2} = \$5.6M$$

c) The coefficient of variation is the ratio of standard deviation to the mean

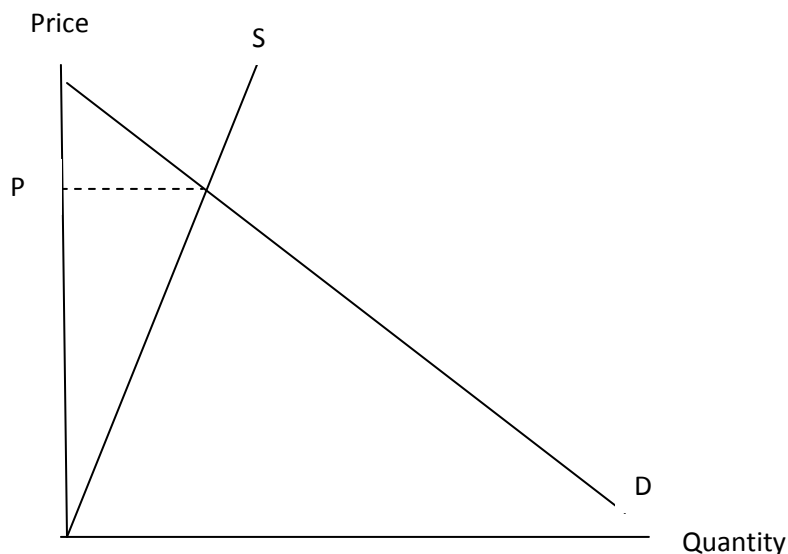
$$v = \frac{5.6}{83} = .067$$

4) This question involves using the normal distribution table in the back of the book:

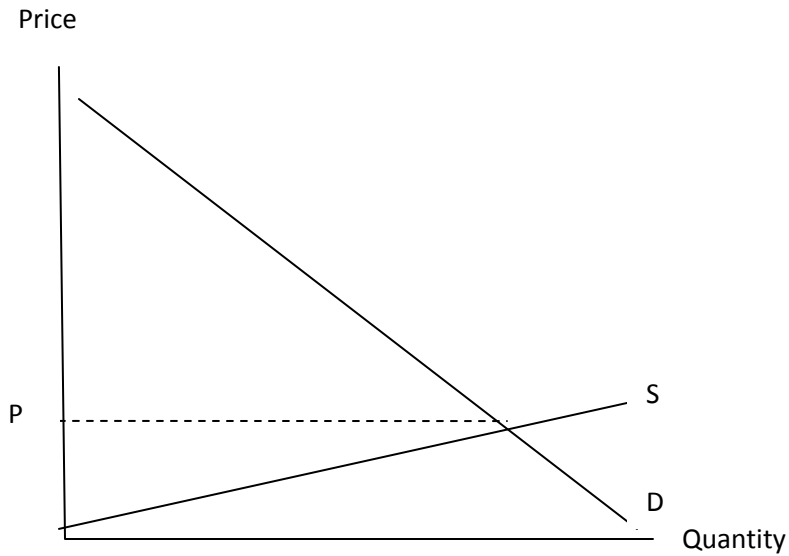
a) With a mean of \$100,000 and a standard deviation of \$40,000, cash flows that are less than zero would represent events that are more than 2.5 standard deviations below the mean ( $100,000 - 0 / 40,000$ ). Go to table B.1 and look down the column on the left hand side for -2.5. The number next to it (.0062) is the probability that we have an event more than 2.5 standard deviations away.

b) Cash flows less than \$20,000 would be 2 standard deviations or more to the left of the mean. Repeat the process from (a) to find a probability of .0228.

7) The difference in price is largely dependent on differences in supply. Take the case of diamonds. With a very low supply, the available diamonds provide a very high level of marginal utility, which is reflected in a high price.



Water, on the other hand, is extremely plentiful. With so much water consumed, at the margin, addition water provides very low marginal utility – this is reflected in a low price.



- 8) SUVs get much lower gas mileage than the subcompact cars. With high gas prices, SUVs become much more expensive to drive than the subcompacts. As demand for SUVs falls and demand for subcompacts rise, the rental rates on subcompacts rise relative to SUVs.