Chapter 11: probs #1, #3, and #4, p. 298
Problem set 4: due week of Feb 20-24
Chapter 12: probs #1 a-b-c-d, #2, #3, pp. 320-321

Future problem sets
· Chapter 13: probs #1, #2 a-b-c-d, #3, #5, pp. 347-348
· Chapter 14: probs #1, #2, #3, #6, pp. 369-370
· Chapter 15: probs #1, #3, #5 a-b, #6, pp. 393-394

Chapter 12: Economics of Information

A. The value of information

We said something has economic value if people are willing to pay for it

People pay for information– how can we think about its value?

Example: Babe Ruth 1933 Goudey baseball card

Option 1: put ad in local classifieds, sell to someone in San Diego for $500

Option 2: auction on ebay, sell to price specified by second-highest bidder

Say highest bid is $900, second-highest is $800

Surplus to seller:
$800 - $500 - $40
= $260

Surplus to buyer:
$900 - $800 = $100

Total surplus generated by ebay:
$260 + $100 + $40
= $400

Using ebay generated a surplus, but what did ebay produce?

Answer: ebay produced the information that there was a seller in San Diego and a buyer in Toronto

broker: someone who gets paid a commission for bringing a buyer and seller together

- stocks and bonds
- real estate

Sales person:

May help provide you with information about which product is best for you

Examples:

- computers
- sports equipment
- hardware

Free rider problem:

Once information is known, it may be possible to use or disseminate without paying for it

Example: obtain detailed information for computer salesperson, then buy online

In some cases, laws may protect the broker to make sure she gets paid (e.g., real estate)

In other cases, the existence of the free-rider problem would lead us to expect that too little information is supplied by the private market

Chapter 12: Economics of Information

A. The value of information
B. Valuation with incomplete information: risk neutrality

Suppose you were looking at a certain business prospect.

If you invest in it, 80% of the time it will pay off $1,000.

20% of the time, it will pay off nothing.

How much is it worth to you?

You don't know how any single investment like this would turn out.

But the laws of probability allow you to be extremely confident that if you made 100 separate investments just like this, the fraction that came out well would be somewhere between 0.68 and 0.92.

If you had *n* separate investments, you could be very confident that the fraction of successes would be bigger than *p0* but less than *p1*

n	*p0*	*p1*
100	0.68	0.92
1,000	0.76	0.84
10,000	0.79	0.81
1,000,000	0.799	0.801

Law of Large Numbers:

As *n* gets bigger, *p0* and *p1* get closer and closer to 0.80

Return to original question.

If you invest in any one project, 80% of the time it will pay off $1,000.

20% of the time, it will pay off nothing.

Suppose you make a large number of investments just like this

Then you might count on the Law of Large Numbers to assure that the fraction of investments paying off would be close to 80%.

In this case, you might view the value to you of a typical investment to be $800

(= 0.8 x $1,000 + 0.2 x $0)

Or more generally, consider an investment with payoffs as follows:

$300 with probability 0.2

$600 with probability 0.5

$1,000 with probability 0.3

If you made a large number of such investments, the fraction paying $300 would be close to 0.2, the fraction paying $600 close to 0.5, and the fraction paying $1,000 close to 0.3.

In this case, you might value a typical investment at:

(0.2 x $300) + (0.5 x $600) + (0.3 x $1,000)
= $60 + $300 + $300
= $660

Definition:

If a random variable has probability

p1 of taking on the value *A1*
p2 of taking on the value *A2*
⋮
pM of taking on the value *AM*

then the *expected value* is defined to be

(*p1* x *A1*) + (*p2* x *A2*) + … + (*pM* x *AM*)

Interpretation: if you observed a large number of realizations of the random variable, the average value you observed would be close to the expected value.

Definition:

An individual is said to be *risk neutral* if the dollar value he or she places on an uncertain outcome is equal to the expected value of that outcome

Example: if the project would pay $1,000 with probability 0.8 and $0 with probability 0.2, if you value it at $800, we say that you are *risk neutral*.

If you value it at less than $800, we say that you are *risk averse*.

Chapter 12: Economics of Information

A. The value of information

B. Valuation with incomplete information: risk neutrality

C. Asymmetric information

Suppose that 90% of the cars that are manufactured work as they're supposed to

But 10% of the cars are "lemons" (constant and expensive repair bills)

Suppose you can't determine whether a car is a "lemon" just by looking at it.

Let's say the value of a good used car to you is $10,000.

But the value of a lemon to you is only $6,000.

Question: how much are you willing to pay to buy a used car?

Calculations of buyer

If:

- 90% of the used cars for sale are good (worth $10,000)
- 10% are lemons (worth $6,000)
- you are risk neutral

then:

you'd be willing to pay

(0.9 x $10,000) + (0.1 x $6,000)

= $9,600

for a used car

Calculations of seller

- Seller (unlike the buyer) knows whether she has a lemon
- Buyer offers $9,600
- If car is good, it's worth $10,000, seller wouldn't want to part with it for $9,600
- If car is lemon, great idea to sell it

Resulting equilibrium:

only lemons are sold on the used car market

Key feature that produced this phenomenon: asymmetric information

Seller knows quality of car, buyer does not

Markets can fail to function efficiently under asymmetric information

George Akerlof

Chapter 12: Economics of Information

A. The value of information

B. Valuation with incomplete information: risk neutrality

C. Asymmetric information

D. Resolving asymmetric information with costly signaling

- Problem: potential seller of a used car needs some way to convince buyer that the car is not a lemon
- In game theory, we saw that the key to resolving credibility problem was some kind of commitment mechanism
- Under asymmetric information, the market's solution to the problem can be costly signaling

- Suppose the seller of a used car issues a warranty
- If the car needs repair, seller will pay for it
- If it's a good car, seller probably won't need to pay for anything
- If it's a lemon, seller will have to pay a good deal
- Only the seller of a good car can afford to offer a warranty

- Whether or not the car is covered by a warranty can be used as a signal by the buyer of whether the car is a lemon
- If the car were a lemon, the signal would be too costly for the seller to make
- Therefore, the signal is credible in equilibrium
- It's not that the buyer necessarily wanted a warranty, just wanted to know it wasn't a lemon

Examples of costly signaling

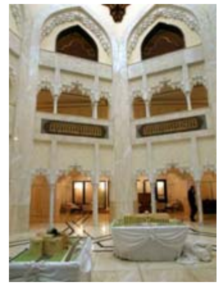
(1) Advertising:

- If product is no good, advertising will ultimately be ineffective
- Advertising may be taken as signal to consumer that product is worth trying

Examples of costly signaling

(2) Saddam's palaces

- Whoever built this has a lot of power
- I better not mess with him



Examples of costly signaling

(3) Education

- Employers want bright, hard-working, reliable employees

Examples of costly signaling

(4) Animal kingdom

- ostentatious displays signal vigor, nutrition

Chapter 12: Economics of Information

A. The value of information

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E. Insurance markets

Insurance policy:

- I pay the insurance company some money now (called the insurance premium)
- The insurance company will cover my expenses if a certain event occurs (house burns down, car is in accident, I get cancer, …)

- Insurance premium is more than the expected value of payout
- E.g., I pay $500 for a car insurance policy that has 1/100 chance of paying $20,000
- insurance premium = $500
- expected payout = $200

- Insurance company makes profit from law of large numbers
- People buy policy because they are risk averse

Potential problems with insurance markets:

(1) Adverse selection

Suppose there are two kinds of drivers:

- safe drivers: probability of accident = 1/200 per year
- risky drivers: probability of accident = 1/20 per year
- payout for accident = $20,000

Expected payout for safe drivers:

(1/200) x ($20,000) = $100 per year

Expected payout for risky drivers:

(1/20) x ($20,000) = $1,000 per year

Suppose that ½ the drivers are safe and ½ are risky and an insurance company issues same policy to both types

Expected payout for safe drivers:

(1/200) x ($20,000) = $100 per year

Expected payout for risky drivers:

(1/20) x ($20,000) = $1,000 per year

Insurance company's expected payout is:

(1/2) x ($100) +

(1/2) x ($1,000)

= $550 per policy

Insurance company could charge $550 per policy and still break even

Expected payout for safe drivers:

(1/200) x ($20,000) = $100 per year

Expected payout for risky drivers:

(1/20) x ($20,000) = $1,000 per year

Suppose that consumers' risk aversion is such that they're willing to pay $1.00 premium for every 50¢ in expected payout

Expected payout for safe drivers:

(1/200) x ($20,000) = $100 per year

Expected payout for risky drivers:

(1/20) x ($20,000) = $1,000 per year

Safe drivers are willing to pay $200/year premium

Risky drivers are willing to pay $2,000/year premium

Conclusion: if insurance policy costs $550, only the risky drivers would buy it

If only risky drivers buy it, insurance company's expected payout is $2,000

Insurance will cost $2,000 in equilibrium

Definition:

adverse selection refers to the phenomenon where high-risk individuals are more likely to buy insurance than low-risk individuals, thereby raising insurance payouts and equilibrium premia

One way insurance companies cope with adverse selection:

statistical discrimination

Insurance company uses some aspect of driver that they can identify that correlates with payout rates

Examples:

- driving record
- age
- zip code

Potential problems with insurance markets:

(1) Adverse selection

(2) Moral hazard

Once I have insurance, I no longer personally pay the cost for my risky behavior

If I engage in more risky behavior precisely because I am insured it is called *moral hazard*

Example of moral hazard: Problems with banks and saving and loan institutions in 1980's

Government insures customer deposits in the bank– customers can then deposit funds in the bank with no personal risk

Banks had made some bad loans, resulting in bank itself having no assets (other than deposits)

Suppose the bank considers the following real estate investment:

- lend \$100 million
- with probability 0.25, get repaid with 10% interest
  = \$110 million
- with probability 0.75, get repaid nothing

- Expected payback from loan =
  (0.25 x \$110 million) + (0.5 x 0)
  = \$27.5 million
- Bank obtains \$100 million from depositors who get 5% interest
- Why would customers lend \$100 million and bank spend \$105 million to earn an expected \$27.5 million?

Incentive for customers:

earn 5% interest at no risk

Incentive for bank:

with probability 0.25:

receives $110 million from loan, pays depositors $105 million, earns $5 million profit

with probability 0.75:

loses nothing

Bank's expected gain:

(0.25 x $5 million) = $1.25 million

Result for government:

with probability 0.75 has to pay depositors $105 million

Conclusion:

If bank has no capital other than customer deposits, government insurance of deposits creates a moral hazard problem whereby the bank has an incentive to make very risky unsound loans

Problem was solved in U.S. by raising bank capital requirements: owners of bank must have substantial personal capital at risk

Problem still not solved in Japan