ME Week 11 Notes

L1: Asymmetric Information 1

Introduction: The value of a newly bought car

New car → 10 Lakh purchase → just drive → << 10 lakhs (Buyers)

1 KM

People doubt what's the problem, hence, less price.

Buy laptop

The Value of Information: The Role of Option Value

Today: option A → 80,000. This person is risk-neutral.

Option B → 350,00 (2/3), 70,000 (1/3)

Tomorrow: 35,000 × 2/3 + 70,000 × 1/3 = 86666.67

R_P = 1,000; CS_B = 1000; $CS_A = \frac{1}{3} \times 11000 = 3666.67$ ⇒ B

$\frac{1}{3}(R_P - 70{,}000) + \frac{2}{3}(R_P - 80{,}000) = R_P - 76666.67$

$R_P - 80{,}000$; 3333.33; on average is the better action

P_1, S_1 → a_1; P_2, S_2 → a_2; $P_1 + P_2 = 1$

$P_1 f_1(a_1|S_1) + P_2(1-P_1) f_2(a_2|S_2)$

$P_1 f_1(a_1|S_1) + (1-P_1) f_2(a_2|S_2)$

The Economics of Information

- Imperfect and Asymmetric Information
- Examples
  - Professionals such as Doctors, Lawyers, and Mechanics
  - Insurance Buyers
  - Loan Seeker

	L	C	R
U	1,2	1,0	1,3
D	2,2	0,0	0,3

	L	C	R
U	1,2	1,3	1,0
D	2,2	0,3	0,0

	L	C	R
U	1,2	1,3	1,3
D	2,2	0,3	0,3

Asymmetric Information affecting the functioning of a Market

- Hidden Information
- Hidden Action
- Two Models
  - Adverse Selection Model
  - Moral hazard Model

e.g. dealer: clothes → 10 million → Insured

Moral Hazard: Suppose you bought 10 M worth of clothes, but got out of fashion, so you burn warehouse to get insurance money.

Adverse Selection: Used Car Market I

Bad cars (Lemons) (P); Good cars (Plum/Peach) (1-P)

Buyers → 2 Lakh, 6 Lakh

Sellers → 1 Lakh, 5 Lakh

Risk Neutral: $2P + (1-P)6 = 6 - 4P \geq 5$ Lakh

$6 - 5 \geq 4P \Rightarrow P \leq 1/4$

when $P > 1/4$ ⇒ $6 - 4P < 5$ Lakhs

only bad cars will be sold ⇒ a price between 1 Lakh & 2 Lakhs

Adverse Selection: Used Car Market II

Value; $0 \leq q \leq 1$ (when buyers don't know the quality); not willing to sell; quality

the car is of average quality ⇒ $\frac{1}{2}(2+6) = 4$ Lakhs

$2 + 4q$ is the maximum they are willing to pay

$2 + 2q = 1 + 4q$ ⇒ $q = 1/2$

⇒ Akerlof → The market of lemons. Research paper

Adverse Selection: Selecting Quality

Toy: MC, RP

HQ: 11, 14, P

LQ: 10, 8, 1-P

Seller is deciding the type

1) to have only HQ product in the market: $14 - 11 = 3$; 10 → ✗

2) to have only LQ ⇒ 8 < 10 ✗

3) $14P + 8(1-P) \geq 11$ ⇒ $8 + 6P \geq 11$ ⇒ $6P \geq 3$ ⇒ $P \geq 1/2$

Reducing Adverse Selection

1. Restricting Opportunistic Behavior
   - Universal Coverage
   - Laws to Prevent Opportunism
2. Information Equalization
   - Signaling
   - Screening
   - Provision of Information by a third Party

Insurance → Health Insurance → 500 → one person

Signaling: Education

Less → knows; knows → more ⇒ Less informed Party; More informed Party

More informed party communicates information to less informed party

Bad, Good (Communication has to be costly so that bad type is not able to mimic the good type)

educate → Impart some skills → signaling

Screening → less informed party tries the lead

JEE mains to get adm. into IIT.

Third-party Information

⇒ Government, or Certification (Credible Information)

it very impt. for 3rd party to be credible

L2: Asymmetric Information 2

Moral Hazard

- Hidden Action
- Moral Hazard with Bank Loan
- Moral Hazard with Insurance

Car → 10 lakh; Money → 3 lakh → In Bank

Good driving costs 3 Lakh, Bad driving costs nothing

P (Accident) = 0.25 → P (accident) = 0.75

P (safe/not Accident) 0.75 → P (Not Accident) = 0.25

don't have an Insurance

In case you have an insurance.

Insurance Vs No Insurance

$U(w) = \sqrt{w}$ — Risk averse person

Good driving → 10 + 3 − 3 = 10 lakhs = 1×10^6 ... 10^7

→ accident (0.25) → 0

→ No accident (0.75) → 10 Lakhs

Expected Utility = $\frac{1}{4} \times \sqrt{0} + \frac{3}{4}\sqrt{10^7} = \frac{3}{4} \times 10^3 \times \sqrt{10} = 750\sqrt{10}$

Bad driving → 10 + 3 = 13 Lakhs = 1.3×10^7

accident → 0.75 ⇒ 13 − 10 = 3 Lakhs = 0.3×10^7

No accident → 0.25 ⇒ 13 ⇒ 1.3×10^7

Expected Utility = $\frac{3}{4} \times \sqrt{0.3 \times 10^7} + \frac{1}{4}\sqrt{1.3 \times 10^7} = 635.83\sqrt{10}$

750 > 635.83

If you don't have insurance, you'll be better off by doing good driving.

Insurance ⇒ 1/4 × 10 lakh = 2.5 Lakhs; fair; 2.75 Lakhs

Good driving → No accident (0.75): 10 + 3 − 3 − 2.75 = 7.25 Lakh

accident (0.25): 10 + 3 − 3 − 2.75 − 10 + 10 = 7.25 Lakh

EV (Good driving) = $\sqrt{7.25}$ lakh

Bad driving → No accident (0.25): 10 + 3 − 2.75 = 10.25 Lakh

Accident: 10.25 Lakh

EV (Bad driving) = $\sqrt{10.25}$ lakh ⇒ Bad driving — Moral Hazard

But if you have insurance, then you'll better off by doing bad driving. This a Moral Hazard.

Moral Hazard in Principal-Agent RelationShips

Principal — Agent ⇒ Moral Hazard, Hidden Action

Share holder — Manager

Shop owner — Manager

Patient/Client — Doctor/Lawyer

Reducing Moral Hazard with Efficient Contract

(In which neither party can be made better off without harming the other party (Pareto efficiency)) → no party can be better w/o harm the other.

1) If parties are risk neutral then their combined benefit should be maximized

2) If one of the parties is more risk averse ⇒ his share of risk should be lower

A	B
100	0
50	50
49	51
25	75
49	49
50	50

An Example

Gita (P) Risk neutral; Mohan (A) Risk averse; State of Nature

	Low Demand (1/2)	High Demand (1/2)
Normal	1000	3000
High (−400)	3000	5000

2000 → work hard ⇒ 2000 − 400 = 1600

0 → don't work Normal; 0

- Symmetric Information

$\frac{1}{2}$ ⇒ 1000; $\frac{1}{2} \times 3000$ ⇒ 2000

Efficient: EV(G) ⇒ 2000

$Var(G) = \frac{1}{2} \times (1000 - 2000)^2 + \frac{1}{2}(3000 - 2000)^2 = \frac{1}{2} \times 10^6 + \frac{1}{2} \times 10^6 = 10^6$

2000, 1600, 3600; Gita → Mohan: 1000, 2000

Asymmetric Information

	Low (1/2)	High (1/2)
Normal	1000	3000
Hard	3000	5000

1000 − 0 = 1000; 1000 − 400 = 600

Gita ⇒ $\frac{1}{2}(0) + \frac{1}{2}(2000) = 1000$

Gita + Mohan → 1000 + 1000 = 2000

Contracts to Reduce Moral Hazard

1. Fixed Fee Contracts — License Fee

Mohan pays a license fee to Gita (2000)

	L	H
Normal	1000	3000
Hard	3000	5000

−1000, 1000 ⇒ 0; (−400); 1000 − 400, 3000 − 400 ⇒ 1600

Total payoff = 2000 + 1600 = 3600

$Var(M) = \frac{1}{2}(1600 - 600)^2 + \frac{1}{2}(2600 - 1600)^2$

Mohan ⇒ nearly risk neutral would rather get a fixed wage: 10^6 license the route

L3: Asymmetric Information 3

2. Contingent Contract

1) When payoff depends on some variable
2) Payoff is contingent on Mohan's action.
3) ⇒ State of Nature ⇒ options to Mohan
⇒ Profit sharing ⇒ Piece rate / commission.
⇒ Bonus

2.a. State Contingent Contract

Mohan pays 1000 to Gitta in case of low demand
3000 to Gitta
Normal ⇒ $0 \times \frac{1}{2} + 0 \times \frac{1}{2} = 0$
Hard = 2000 − 400 = 1600
$EV(Gitta) = \frac{1}{2} \times 1000 + \frac{1}{2} \times 3000 = 2000$
$Var(Gitta) = 10^6 \left(\frac{1}{2}(1000-2000)^2 + \frac{1}{2}(3000-2000)^2\right)$
Efficient contracting
or Revenue sharing

2.b. Profit Sharing Contract

x ⇒ $\frac{1}{2}\left[\frac{1}{2} 1000 + \frac{1}{2} \times 3000\right] = 1000$ by working normal
y ⇒ $\frac{1}{2}\left(\frac{1}{2} 3000 + \frac{1}{2} \times 5000\right) = 2000$ by working hard
−400 = 1600
Mohan will work hard
1100 2100
$Var(Mohan) = \frac{1}{2}(1100-1600)^2 + \frac{1}{2}(2100-1600)^2$
$= 250000 = 2.5 \times 10^5$
$EV(Gitta) = 2000$ $Var(Gitta) = 10^6$
Total Payoff is maximized
20%

2.c Bonuses

Wage → 1000
Tax + 2000 ⇒ 2000
$\frac{1}{2} \times 1000 + \frac{1}{2} \times (1000 + 2000) = 2000$
400
1600

	LD	HD
Normal	1000	2000
Hard	3000	5000

$Var(Mohan) = 10^6$

2.d. Other Contingent Contracts

Option : The option gives Mohan the right to buy a certain number of share of this firm at specified price during specified time interval.

Monitoring to Reduce Moral Hazard I

- Direct Monitoring
- 25%

75% 81%
In US
75% companies do monitoring of employees
→ such companies don't even tell the employees

Monitoring to Reduce Moral Hazard II

- Hostage for good Behavior
- Bonding (Performance Bond)
- Deferred Payment
- Efficiency Wage

opportunity cost

After the Fact Monitoring

- Later Verification

Gitta & Mohan

	LD	HD
Normal	1000	2000
Hard	3000	5000

5000
1000

Refused to Pay → this scenario is also possible. Any party can cheat.

L4: Externalities

Externality

- Externality: An uncompensated impact of one economic agent's action/decision/choice on the well-being of another who is not participating in the relevant economic transaction.
- This makes the market inefficient and therefore, the market mechanism fails to maximize the social surplus.

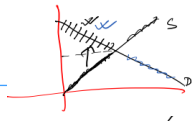
Two Types of Externalities

- Negative: When the impact on the other economic agent is adverse
  - Automobile Exhaust
  - Loud Music
  - Polluting Industry (?)
  - Cigarette Smoking
- Positive: When the impact on the other economic agent is beneficial
  - Research with Spillover
  - Manicured Lawns
  - Immunization
- Negative externalities lead the market to produce larger quantities than what is socially desirable

more output → less output → it stops the society to reach maximum benefit.

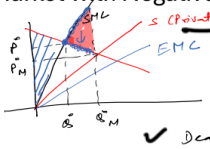
A Market without Externalities

Private Marginal Benefit = Social Marginal Benefit ⇒ Demand Curve
Private Marginal Cost = Social Marginal Cost ⇒ Supply Curve
Total surplus is maximized.



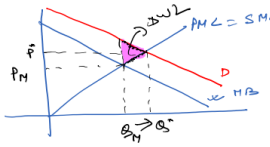
SMC = EMC

A Market with Negative Externality



Producers side
Consumers side
Social
SMC = PMC + EMC
Dead weight loss

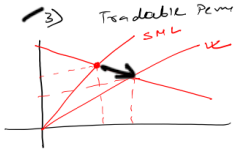
A Market with Positive Externality



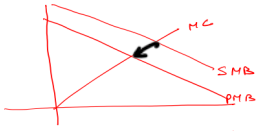
EMB
SMB = PMB + EMB

Getting Back to Optimal Point → Government helps

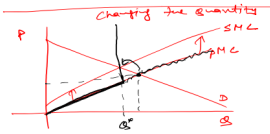
1) Changes the price
2) Changes the quantity.
3) Tradable Permits.



EMC → tax
Pigouvian Tax
SMC = PMC + EMC
PMC ≠ T



Subsidies
SMB = PMB + EMB
= S



Production Quotas
Imposes a limit on quantity that a firm can produce
EMC ⇒ Tax

Tradable Permit — Carbon Trading
allowed to pollute to certain extend
40 ⇒ Tradable