Lecture 2

Marginal Benefit: the value from the last unit consumed/produced

Marginal Cost: the cost of the last unit consumed/produced

Optimization: $MB = MC$

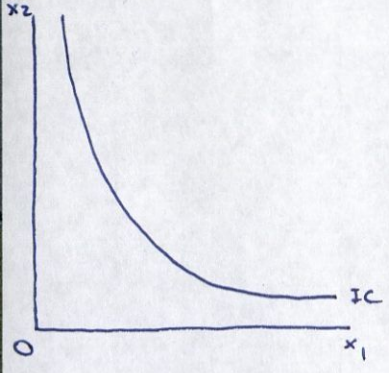
Preference Maps

Indifference Curves: map the set of bundles of goods that a consumer views as being equally desirable (Indifference map shows the complete set of a consumer's indifference curves)

Marginal Rate of Substitution: (MRS) the maximum amount of one good a consumer is willing to give up to obtain one more of another good.

MRS = Slope of indifference curve

$MRS_{x_1 x_2} = \frac{\Delta x_2}{\Delta x_1}$ is MRS of x_2 for x_1, number of x_2 for x_1



Curvature: IC are convex to the origin, because when consumers have more of a good, they will trade more of it for one unit of another good.

Utility: unit of measurement that expresses relative order of preference of bundles to consumer. ~~Quantifies satisfaction...?~~ Ordinal rank!

Indifference Curves consist of bundles of goods that all have equal utility to a consumer. Further out → more utility

Marginal Utility: the extra utility that a consumer gets from consuming the last unit of a good. Exhibits diminishing marginal utility: as consumer consume more of a good, their marginal utility decreases.

$$MU_a = \frac{\Delta U}{\Delta G}$$

* Marginal Rate of Substitution (MRS) is equal to the negative ratio of the marginal utility of x_1 to the marginal utility of x_2

$$MRS_{x_1, x_2} = \frac{\Delta x_2}{\Delta x_1} = -\frac{MU_{x_1}}{MU_{x_2}}$$

Preferences: $\geq, \leq$ → Utility

$>, <$ → Preference

① Completeness: consumers will always have an opinion, infinite num of ICs

② Transitivity: If $A \geq B$ and $B \geq C$, $A \geq C$

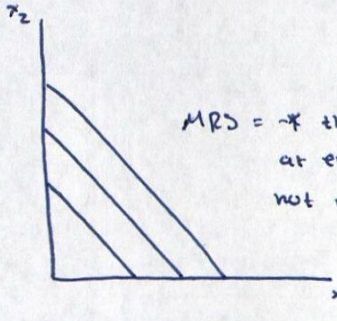
③ Nonsatiation: more is always better

Properties:

- Indifference curves further from the origin are preferred to those closer to the origin
- An indifference curve goes through every possible bundle
- Indifference curves do not cross
- Indifference curves slope downwards

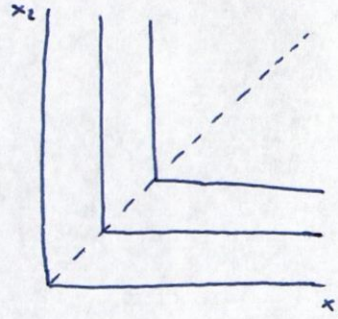
Diminishing Rate of Substitution: MRS approaches 0 as you move along an IC to the right

Perfect Substitutes



MRS = -1 the same at every bundle, not necessarily = -1

Perfect Compliments



Utility only increases if quantity of both increases

Lecture 3

Budget Constraint

Assume that the consumer's budget is given and that the only purchase two goods.

$$I = P_{x_1} X_1 + P_{x_2} X_2$$

where: I = Income

P_{x_1} = Price of good X_1

X_1 = Quantity of X_1

P_{x_2} = Price of good X_2

X_2 = Quantity of X_2

Budget Line: the bundles of goods that can be bought if the entire budget is spent on those goods at given prices

Affordable Set: all the bundles a consumer can buy, including all bundles inside the budget line and on the budget line/constraint

Slope of the Budget Constraint is determined by the relative prices of the two goods.

Marginal Rate of Transformation: (MRT) the trade-off the market imposes on the consumer in terms of the amount of one good the consumer must give up to obtain more of the other good. (= slope of the budget constraint)

$$MRT = \frac{X_2}{X_1} = -\frac{P_{x_1}}{P_{x_2}}$$

Changes in Income

① Increase

Increase in income increases the quantity of goods a consumer can purchase for both goods, shifting budget constraint outwards.

② Decrease

Decrease in income decreases the quantity of goods a consumer can purchase for both goods, shifting budget constraint in.

Changes in Price

① Increase

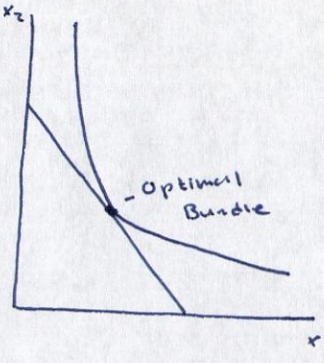
Increase in price decreases the quantity that a consumer can buy. The budget constraint will pivot in to reflect this. Reduces overall utility.

② Decrease

Decrease in price increases the quantity of a good that a consumer can buy. The budget constraint will pivot out to reflect this. Increases overall utility.

Optimal Bundle

The optimal bundle is that which gives the consumer the most pleasure (utility) out of their affordable set. This bundle will be on an indifference curve that is tangent to their budget constraint. This way, they will be using all of their budget, and be on the furthest out indifference curve.



The optimal bundle lies at the point where Marginal Rate of Substitution = Marginal Rate of Transformation

$$MRS = MRT$$

$$MRS = -\frac{MU_{x_1}}{MU_{x_2}} = -\frac{P_{x_1}}{P_{x_2}} = MRT$$

where the slope of the budget constraint is equal to the slope of the indifference curve.

MRS = Price Ratio

Necessary Condition:

① The indifference curve is tangent to the budget constraint

② The consumer buys the bundle that is on the highest possible indifference curve

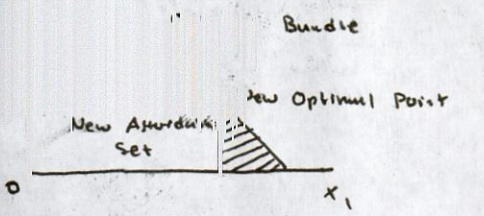
③ MRS = MRT

④ The last dollar spent on Good X_1 gives the consumer as much utility as the last dollar spent on X_2

Exceptions

Rationing

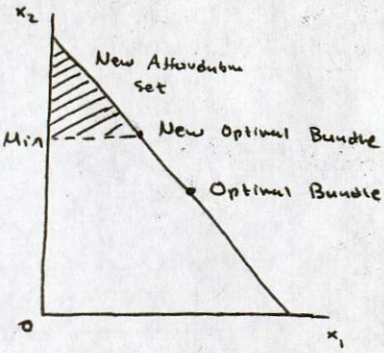
Rationing is a situation in which there is a maximum quantity of a good that you can buy.



- Utility has decreased for those whose optimal point was outside the new affordable set. For those whose original optimal bundle was in the new affordable set, nothing has changed.

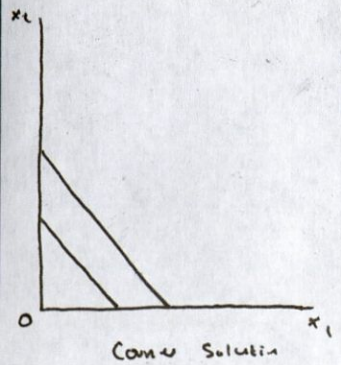
Minimum Required Purchase

A situation in which there is a minimum quantity required to purchase a good.



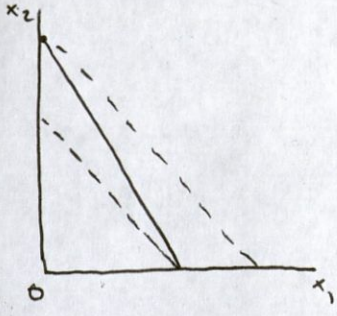
- Utility has decreased for those whose optimal bundle was outside the new affordable set. For those whose original optimal bundle was in the new affordable set, nothing has changed.

Perfect Substitutes



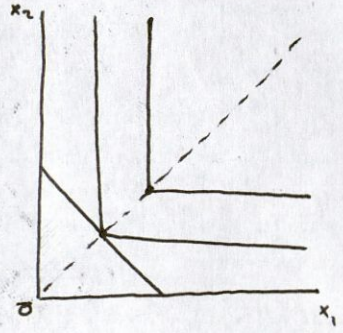
MRS is constant at all bundles.

Corner Solution



With perfect substitutes, MRS is fixed at 1, so you should buy whichever you can buy more of. This is called a corner solution.

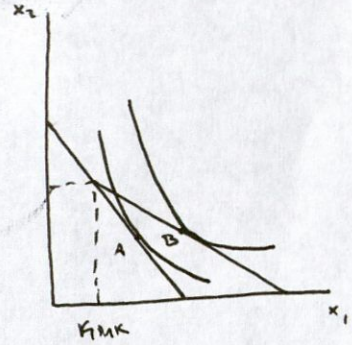
Perfect Compliments



Utility only increases if the quantity of both goods increases. Extra units of one good don't increase utility without increase in the quantity of the other good. There will be an ideal ratio. Bundle must be on that line.

Volume Discounts

Volume discount means that after a certain quantity, price falls.



Kink Point (at x quantity)

This changes the MRS. Will result in an increase of consumption of that good, leads to higher utility. Optimal Bundle is still when MRS = Price Ratio

Lecture 4

Ceteris Paribus: "with other things the same"

Comparative Statistics: an exercise in which you alter a variable within a model to see what happens

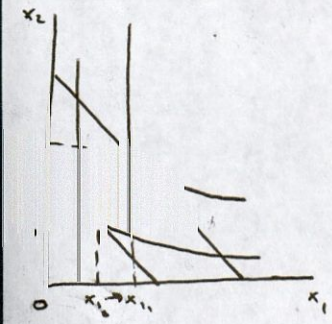
Normal Goods: goods for which quantity demanded increases as income increases

Exception: whenever exactly double both income and all prices, the budget constraint remains the same. The optimal bundle will remain the same.

Inferior Goods: goods for which quantity demanded falls as income increases

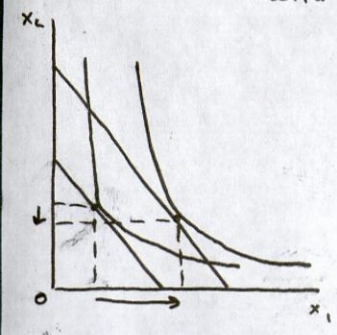
Giffen Goods: goods for which quantity demanded increases as price increases

Income Increases

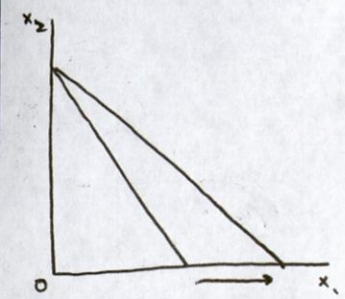


Income increases will shift the budget constraint outwards in a fashion such that the two BC's are parallel. Quantity of both goods at optimal bundle increases.

Income Increase with an Inferior Good



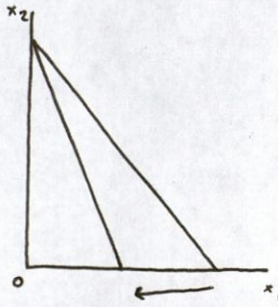
Price Decrease



Increase quantity of good to which price decreases.

Expands attainable set.

Price Increase



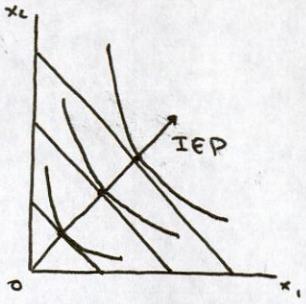
Decreases quantity to which price increases.

Contracts attainable set.

Income Expansion Path

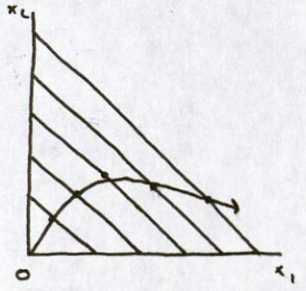
The income expansion path is the curve that connects all of the optimal bundles as income increases from zero.

For two Normal Goods:



For two normal goods, the IEP will be increasing on both axes

For one Normal and one Inferior

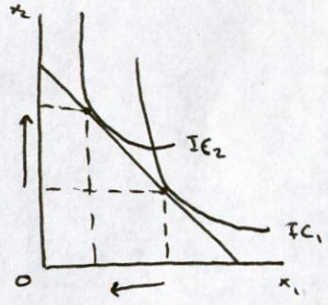


x_2 = Inferior

x_1 = Normal

Preference Changes

Indifference curves change when a consumer's preferences change.



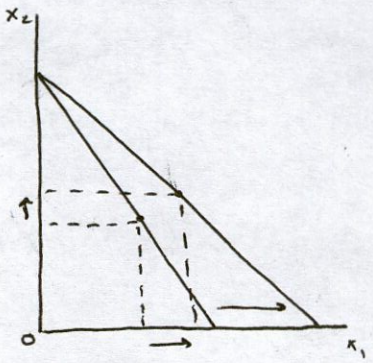
Prefers x_1 decreases, more willing to trade x_1 for x_2

MRS_{x_1,x_2} ↑

Compliments

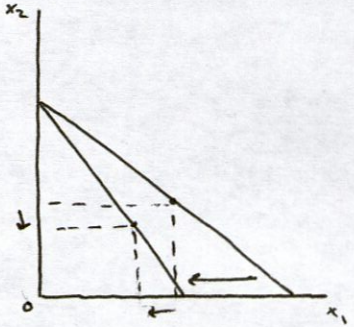
Two goods are considered compliments if an increase in the price of one good leads to a decrease in the demand for the other. Conversely, ~~the~~ a price decrease in one will lead to an increase in the demand for the other.

Price Decrease



- Price of X_1 decreases
- Demand for x_1 increases
- Demand for x_2 increases

Price Increase

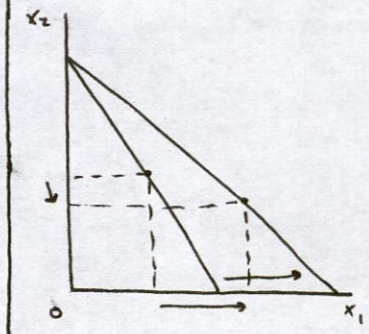


- Price of X_1 increases
- Demand for x_1 decreases
- Demand for x_2 decreases

Substitutes

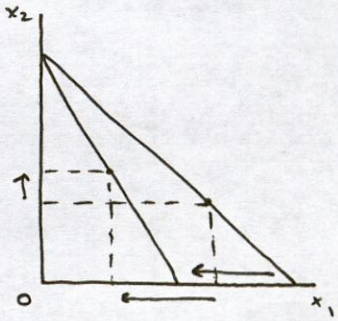
Two goods are considered substitutes if an increase in the price of one good leads to an increase in the demand for the other. Conversely, a decrease in the price of one will lead to an increase in demand for the other.

Price Decrease



- Price of x_1 decreases
- Demand for x_1 increases
- Demand for x_2 decreases

Price Increase



- Price of x_1 increases
- Demand for x_1 decreases
- Demand for x_2 increases

Substitution Effect, Income Effect, and Total Effect

Changes in the price of a good has two effects on an individual's demand:

Substitution Effect: the change in quantity demanded that results from substitution due to one good becoming relatively more expensive and the other becoming relatively less expensive. Consumers substitute towards the good that is less expensive.

Income Effect: the change in quantity demanded that results from the change in the consumer's buying power. Price increase → ↓ buying power → ↓ demand

Total Effect: the overall change in quantity demanded that results from a change in price. TE = SE + IE

	TE	SE	IE
Good 1			
Good 2			

* Assuming price change in Good 1

IE of Good 1 : if normal
IE ↑ if P↓
IE ↓ if P↑
if inferior
IE ↑ if P↑
IE ↓ if P↓

IE of Good 2: if normal
IE ↑ if P↓
IE ↓ if P↑
if inferior
IE ↑ if P↑
IE ↓ if P↓

TE of G1 : If normal....
TE ↑ if P↓
TE ↓ if P↑
Is inferior
TE
TE

SE of G1: SE ↑ if P↓
SE ↓ if P↑

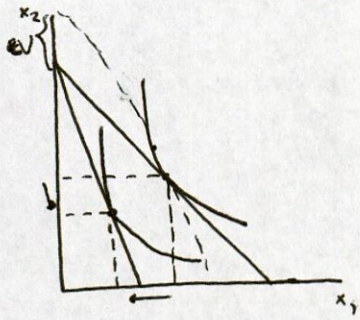
TE of G2 : If normal
Substitutes:
TE ↑ if P↑
TE ↓ if P↓
Compliments
TE ↑ if P↓
TE ↓ if P↑

SE of G2: SE ↑ if P↑
SE ↓ if P↓ } Substitutes

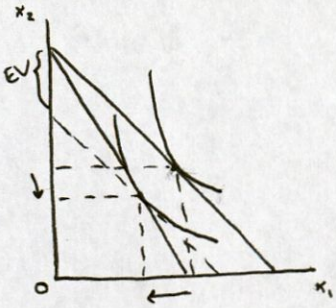
SE ↑ if P↓
SE ↓ if P↑ } Compliments

Lecture 5

Compensating Variation: (CV) the amount of money one would have to give a consumer to offset the harm done by a price increase (or take from a consumer to offset the benefit of a price decrease.



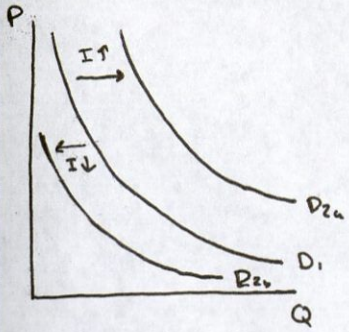
Equivalent Variation: (EV) the amount of money you would have to take from a consumer to harm them as much as a price increase (or give to a consumer to benefit them as much as a price decrease.



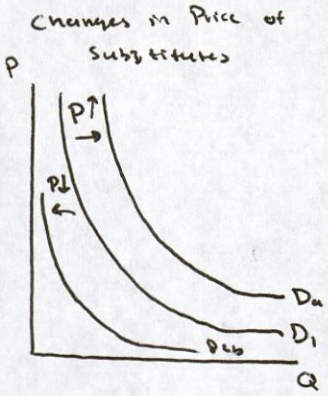
Movement vs. Shift in the Demand Curve

Movements along the demand curve are caused by the good changing in price. Actual shifts of the demand curve are caused by: changes in income, changes in price of compliments, changes in price of substitutes, changes in preferences.

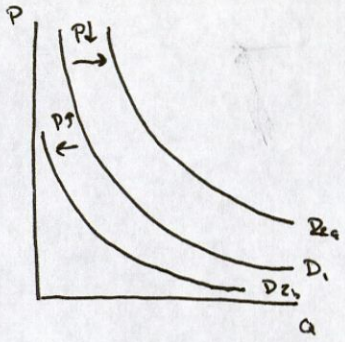
Changes in Income



Changes in Price of Substitutes



Changes in Price of Compliments



Individuals → Market Demand & Market Demand Curve

Market Demand: the sum of all individual's quantity demanded for a given price

Market Demand Curve plots market demand at given prices.

Deriving Market Demand Equation

Lecture 6

Revealed Preference: consumers reveal their preferences by their purchasing behavior

Elasticity: measures how responsive people are to a change in a given variable

General Form: $\mathcal{E} = \frac{\Delta Q/Q}{\Delta P/P}$

Own-Price Elasticity: the percent change in quantity demanded in response to a given percent change in the price of that good

$$\mathcal{E} = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Cross-Price Elasticity: the percent change in quantity demanded in response to a given percent change in the price of another good (− → C, + → S)

$$\mathcal{E} = \frac{\Delta Q/Q}{\Delta P/P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$$

Income Elasticity: the percent change in quantity demanded in response to a given percent change in a consumer's income

- Necessities have income elasticity between 0 & 1
- Luxuries have income elasticity > 1

$$\mathcal{E} = \frac{\Delta Q/Q}{\Delta Y/Y} = \frac{\Delta Q}{\Delta Y} \cdot \frac{Y}{Q}$$

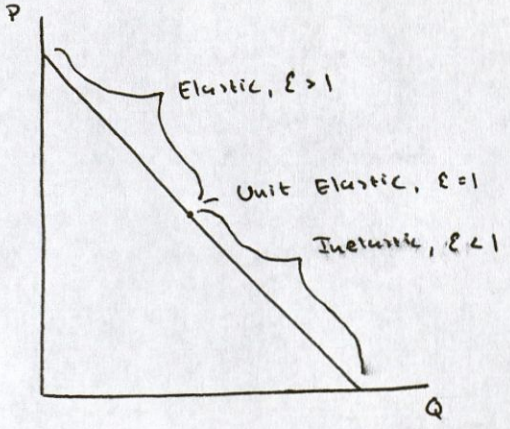
Elasticity over Time:

Goods tend to become more elastic over time due to: - high transition costs
- need to wait for preferences to change
- technological advances

Elastic: change in quantity demanded was greater than price change. $\mathcal{E} > 1$

Unit-Elastic: change in quantity demanded was equal to change in price. $\mathcal{E} = 1$

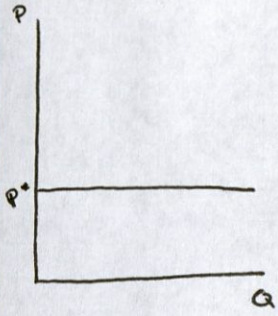
Inelastic: change in quantity demanded was less than the change in price $\mathcal{E} < 1$



The higher in price, the more elastic

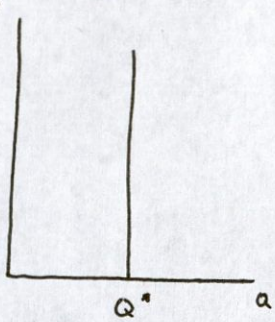
Constant Elasticity

Perfectly Elastic



Consumers are willing to purchase any quantity at price P^*. Any price change → no demand.

Perfectly Inelastic



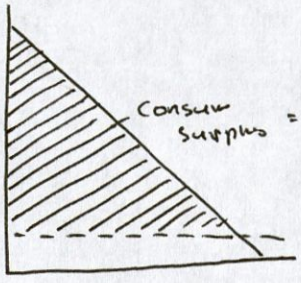
Consumers will purchase/demand Q^* regardless of the price. Happens with essential goods.

Maximizing Profit

Expenditure = Revenue

- Movement towards point of unit elasticity increases revenue
- Revenue is maximized at point of unit-elasticity

Consumer Surplus



Lecture 7

Expected Value: the average outcome of an experiment if it were to be repeated many times

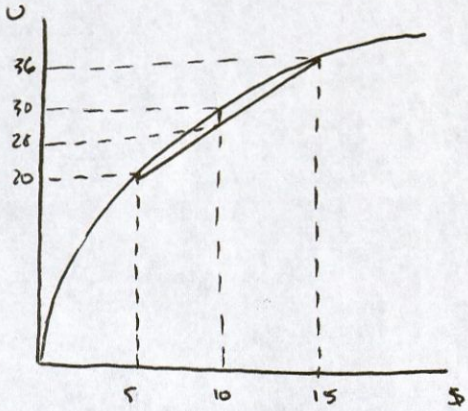
$$EV[x] = P(x_1)(x_1) + P(x_2)(x_2) + \dots P(x_n)(x_n)$$

Fair Bet: a wager for which the expected value = 0

Expected Utility: the probability-weighted average of the outcome of an experiment

$$EU(x) = P(x_1)U(x_1) + P(x_2)U(x_2) + \dots P(x_n) + U(x_n)$$

Risk Aversion: those who are risk averse dislike risk and are less willing to take a fair bet. This is the case with most people, and happens due to the diminishing marginal utility of wealth.



$10,000 income. 50/50 bet to win/lose $5,000.

$U(15) = 36$, $U(10) = 30$, $U(5) = 20$

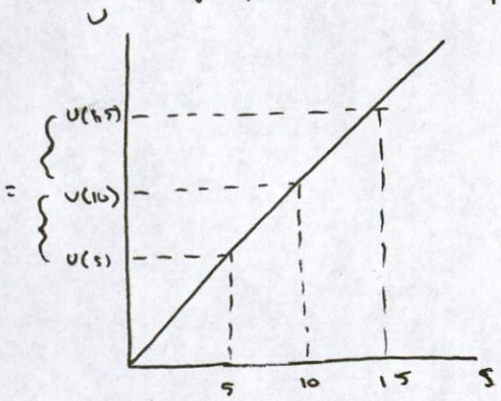
$EV = (0.5)(15) + (0.5)(5) = 10$

$EU = (0.5)(36) + (0.5)(20) = 28$

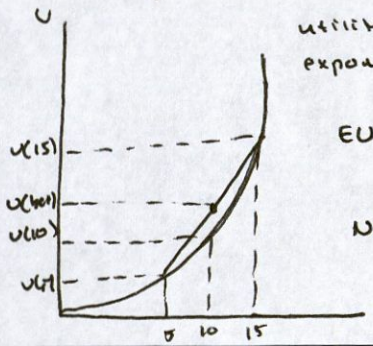
$EU(bet) = 28 < 30 = U(30)$

Don't take bet

Risk Neutral: Those who are risk neutral base decisions on expected value. They do not have diminishing marginal utility of wealth. Their utility function is a straight line. They are indifferent towards taking fair bets. Risk premium = 0



Risk Loving: Those who are risk loving love risk and prefer to make a fair bet. They exhibit increasing marginal utility of wealth. Their utility function is an exponential graph.



EU(bet) > U(no bet)

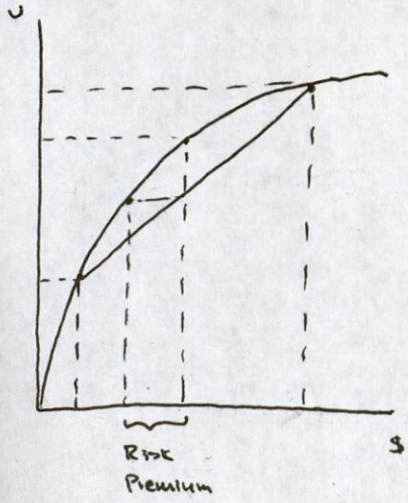
Take bet.

Negative risk premium

Insurance

People buy insurance in order to avoid the negative consequences of gambles that are unavoidable.

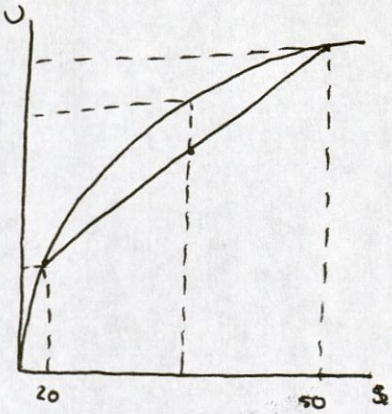
Expected Loss = $P(L) \cdot V(L)$



Risk Premium is the amount of money a consumer would be willing to pay to avoid the bet. This will be the level of income that provides the same level of expected utility as the bet.

* AFP doesn't change with consumers having various degrees of risk aversion. Solely based on the insurer's expected loss.

Actuarially Fair Premium



Ned has an income of $50,000. He has a 25% of becoming sick when medical bills = $50,000. What is the minimum he would have to pay for insurance?

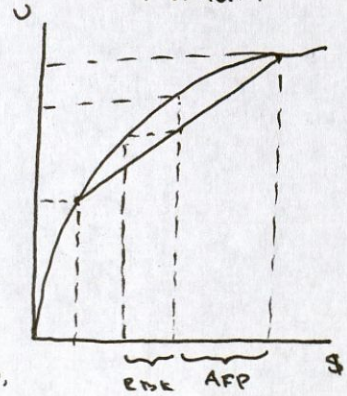
EU = (0.75)(50) + (0.25)(20) = 42.5 k$

EL = (0.25)(30) = 7.25 k$

The Actuarially Fair Premium is the amount that the insurer would have to charge in order to break even.

AFP = EL

Risk Premium



What is the maximum amount of money Ned would be willing to pay for insurance?

where U = EU (bet)

Example: AFP with two risk types

Ned and How both make $50,000, and both would pay $30,000 if sick. Ned has a 25% chance of getting sick. How has a 75% chance of getting sick. Insurer can't tell who is who, what is the AFP?

EL (Ned) = (0.25)(30) = 7.5K

EL (How) = (0.75)(30) = 22.5K

$$AFP = \frac{(0.25)(30) + (0.75)(30)}{2} = 15 k\$$$

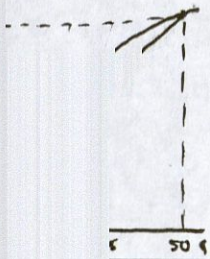
With How buying insurance and Ned opting out, the insurers' EL = (0.75)(30) = 22.5 > 7.5, which would make AFP = 22.5K. How wants to go into market with Ned, but Ned is unhappy.

Asymmetric Information
Hidden Characteristic
Hidden Action, opportunistic Behavior

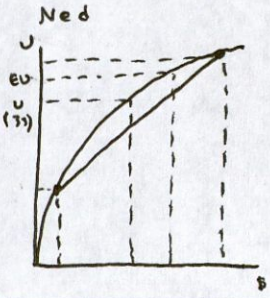
Adverse Selection: when one party in a transaction has knowledge of a hidden characteristic that the other doesn't know about (AI) and takes economic advantage of the other.

- Insurance companies can't distinguish between risk profiles, charge the average AFP, only risky people end up with insurance, eventually wipe off

How



Ned



How is happy, because his EU < U(insurance). He buys insurance.

Ned is not happy, because his EU > U(insurance). He does not buy insurance.

Average AI:

Underwriting: process by which insurers screen for risk type

- Prevent good risks from dropping out (mandatory insurance, ACA)
- Make the bad risks better (reform pre-existing conditions)

Incentive Compatibility

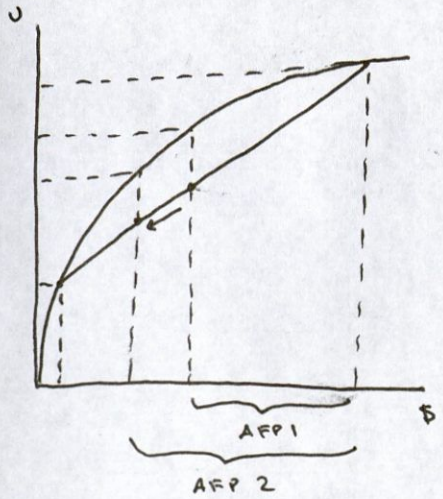
Pooling Equilibrium: where dissimilar people are treated or behave alike. Here, when Ned and Homer are treated the same and pay the same premium.

Separating Equilibrium: where individuals can take actions to distinguish themselves from others. Here, where Ned and Homer pay individual premiums based on risk profile.

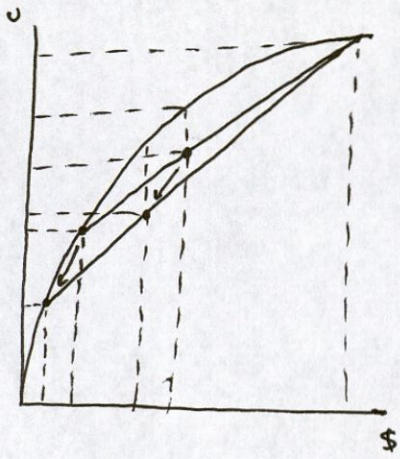
Incentive Compatible: situation in which every participant can achieve their own best interest. Here, Ned and Homer would behave in their best interests and reveal their risk types naturally.

Moral Hazard

Ex-Ante Moral Hazard: the insured actor increases the likelihood of the insured-against event occurring, either by engaging in risky behavior, or failing to take preventative steps.



Ex-Post Moral Hazard: once the insured-against event occurs, the policy-holder makes the loss worse by incurring costs she would not have incurred if she had not been insured.



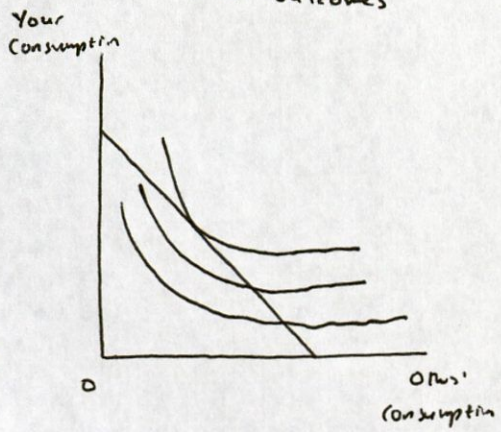
Lecture 8

Rational Consumer: - Fully informed about all options
- Fully optimized about all options
- Important factors: preferences/utility, prices, income, probability of outcomes

Altruism: Altruistic people consider the well being of others as part of their utility function

Pure Altruism: trading one's own utility to increase the utility of someone else with no expectation of compensation

Impure Altruism: the act of giving increases our own utility by increasing self-esteem and making us look better (warm glow) with warm glow, impure altruists have high utility when others' utilities are high and have the ability to raise their own utility by raising others'



Social Welfare Function

$W = q_1 U_1 + q_2 U_2 + \dots + q_n U_n$

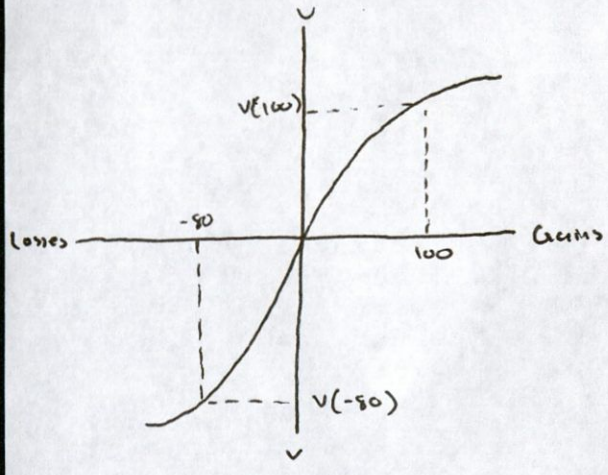
where q = social weight, i.e. how much they matter in the decision process

Sunk Costs: costs that are beyond recovery at the time the decision is made. (Rational consumers do not consider, irrational do)

Framing: the way questions are framed can change people's decisions

Asymmetric Value Function

Loss Aversion: Losing $X decreases utility more than $X increases it



Heuristics: simple rules (shortcuts) that humans use to make decisions

① Availability: mental shortcut that relies on the first examples that come to mind relating to something

② Representativeness: we pay more attention to extraordinary cases, even though they may not reflect the true prevalence of an event

③ Anchoring: we tend to not adjust away enough from our preliminary estimate