Lessons from Quiz 1

• Opportunity cost.

• Elasticity $\epsilon = -(\partial q/\partial p)/(p/q)$
  – Most of you missed the minus sign

• Trivial but significant.
  – Recall $\epsilon > 1 \Rightarrow$ demand inelastic (revenue increases with price).
  – With normal goods ($\partial q/\partial p < 0$) so $(\partial q/\partial p)/(p/q) < 0$ which would imply that at any price you should lower price to increase revenue! Add – sign back and everything works out!
Exchange economies
OUTLINE

1. The problem
2. Review of consumer theory
3. Theory
4. Example
   1. 2 person 2 goods
5. Application
   1. Secondary Financial markets
The problem

• In the theory of the consumer we take a bunch of things as given
  – Useful but limited

• But what happens in real economies where prices and quantities are determined simultaneously and where consumer behavior affects prices?
Individual with an endowment responds to relative prices

New choice when Y is cheaper relative to X

$(X_0, M_0)$ endowment

New choice when Y is expensive relative to X
Review Consumer Theory

• Consumer theory
  – n good economy.
  – Have income $Y$
  – Observe prices $P=(p_1, p_2, \ldots, p_i, \ldots, p_n)$
  – Decide what and how much to buy
  – Given finite income and positive prices, for Most utility functions there is a unique vector $X=(x_1, x_2, \ldots, x_i, \ldots, x_n)$ that maximizes the utility of a given consumer subject to budget balance.

• But where doe income come from?
  – Endowments (1) or production (2)
From the individual to an economy

• Criterion for individual decision
  – Maximize utility.
    • Given an endowment and prices, and mild conditions on utility; solution is well defined (unique and well behaved)
    • So we don’t have to worry too much about how this happens

• What about a criterion for an economy?
  – Here scarcity complicates things. What make individual 1 better off might to make individual 2 better off.
Allocation for an economy

• Allocation mechanism—the process that decides who gets to consume what to have some properties.
  – (0) maximize aggregate Utility
    • Nice but can’t do because we can’t weight one person’s happiness relative to another.
  – (00) egalitarian
    • Well how do we figure that out? If people have different preferences same pb as above

• Two basic properties we must have
  – (1) Equilibrium (stability)
  – (2) Efficiency (nothing better)
Pareto Efficiency

• Weakest possible criterion
• Start with endowments for n individuals
  \[ Z = \{Z^1, \ldots, Z^i, \ldots, Z^n\} \] where \( Z^i \) is individual i’s endowment
• Allocation \( X = \{X^1, \ldots, X^i, \ldots, X^n\} \) is pareto efficient if there is no other allocation \( X' \) such that \( U^i(X^i') > U^i(X^i) \) for individual \( U^j(X^j') \geq U^j(X^j) \) for all other individuals.
To Exchange economies

- Here take step 1. individuals’ income comes from endowment.
- Assume that each individual is endowed with an initial vector
- $Z_i=(z_1, z_2, \ldots, z_j, \ldots, z_m)$. So the collection of endowments is $Z=\{Z^1, \ldots, Z^i, \ldots, Z^n\}$
- Can you get from these endowments basket to something better?
  - What would you need to know?
- Economists: can exchange get them to something better?
Equilibrium

• An exchange equilibrium
  – A set of prices $P^* \text{ and a set of } X^i \text{ such that}$
  – 1) for each individual $PZ^i = PX^i$
  – 2) there exists no other vector $X^i'$ such that $PZ^i = PX^i'$ and $U(X^i') > U(X^i)$.
  – Condition 1 is budget balance
    • you can afford what you end up with
  – Condition 2 is individual efficiency
    • No individual can afford anything that is better for him

• Note this says nothing about society. Its all individual.
• Does this lead to (Pareto) efficiency.
General Equilibrium

- $m$ goods, $n$ people, convex preferences
- First welfare theorem: any price system equilibrium is pareto efficient.
- It turns out this is easy to prove if the world is simple (certain, smooth) and does depend on a variety things
- It also does not say much.
General Equilibrium

• Second welfare theorem: any efficient point is a price system equilibrium for some endowment

• In a way. This says that you can’t do better than the price system.
  – But note both theorems say nothing about prices
  – As we are going to see, some prices are better for some people than others.
Why are the theorems true?

• We will not prove them but here is the basic idea.
• Existence
  – Start with Z, then imagine a vector prices P.
  – Let each individual maximize utility (find his own $X^i$)
    $(P)$. $x^i_j - z^i_j - (p_j)$ is his (excess) net demand for good j.
  – Add all the net demand for good j. If positive then
    people want to buy more than is available (price is too
    low for an equilibrium)
  – So raise as the prices for good with positive excess
    demand and lower all the prices with negative excess
    demand.
  – If you do that then excess demand must shrink. If you
    move in small steps you will find an equilibrium.
From existence to efficiency

• Equilibrium means that there are no excess demand.
  – That means that pair-wise price ratios are equal to pair-wise marginal utilities for each individual.
  – But efficiency also implies that all of the goods have been allocated. So the only way to make individual i better off is to take some of good away from another person. (but doing just that would violate efficiency)
  – So individual i would have to give something up. But the fact that the margins are aligned means there is no way to do that. (all individuals want to trade off at the same rates)
From efficiency to equilibrium

• Pareto efficiency says we can’t make i better off without making j worse off.

• Suppose there was an PE allocation (X) that was not a price equilibrium.
  – That would say that there is no price vector P such that at X excess demand is zero for all goods.
  – Take a price vector such excess demand is positive for some good (and because of budget balance negative for another).
  – Again I can fiddle with prices such that I can find a new vector P’ that leads to a new allocation X’ where excess demand is zero. Because people voluntarily traded from X to X’ X cannot be Pareto efficient
Example

• Two individuals
  – Convex utility (more of a mix is better than extremes)

• Two goods

• Everything else hard to graph

• But all the intuition
  – Pareto efficiency
  – Equilibrium with prices
  – Multiplicity of equilibria
Edgeworth Box

- Two people, two goods
- Given total endowment of goods
Pareto Efficiency

\[ u_1 \]
Contract Curve
Individual Rational, Efficient Points
Price System Existence
Conclusion from theory

- Price system is individually rational
  - You can’t be made worse of by it.
- Price system is Pareto Efficient
  - At equilibrium no-one can do better
- But multiple equilibria
  - Many possible path to an equilibrium from an endowment point.
- But is it fair?
  - In the simplest sense that has to do with endowments not with the price system
  - If you want to make the economy “fairer” redistribute before the market.
Redistribute before the market

At initial point individual 1 (blue) is rich.

If we want to be fair we can tax some of good X away from him and give it to 2 (red). That improves endowments.

Tax or not the market improves Utility.
So where do we see exchange economies?

• Trade caravans?
  – Well when you meet you don’t produce anything. But everyone is usually a net demander of some item and a net supplier of another (and prices don’t really change the sign of demand for anyone)

• Swap meets?
  – Well

• Financial markets?
Financial markets as exchange economies

• This is the basic paradigm
  – Prices reflect information about the expected return and its variance

• Result 1.
  – The no trade condition. Everyone wants to maximize profits and is equally risk averse. So everyone will have the same portfolio. When news comes in. Prices change nothing trades.
  – Why?
Rational expectations and the no trade condition

• Is asymmetric information enough to get trade?
• No. Even if different actors know different things. Their demands are going to reveal what they know?
  – I want to buy more of United Airlines because I ‘know’ the merger is going to happen.
  – To do that I have to put in an order, and that order reveals what I know.
  – Given that a potential seller has the same preferences as I he infers that I have good news about United and does not sell…Price does change.
Financial markets as exchange economies

• Result 2: pricing risk
  – Here we allow agents to be heterogeneous (some are rich and more willing to bear risk).
  – At any point in time portfolios are different (the rich own more of the riskier assets).
  – Now assume that there is news, one security that was relatively safe has become riskier.

• Then its price will change and trade will occur.
  – Will its price increase or fall?
  – Tricky (because of portfolios) in fact it could rise!
Conclusion and the road ahead

• Economies can reach equilibria and these are the best we can do without knowing individual preferences.
• Even if we knew individual preferences we would be choosing one price equilibrium or another
• But where does the stuff come from?
  – There has to be a production side to economies