Markets as a Substitute for Rationality

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Markets as Substitute for Rationality

Markets are generally said to converge to a match between supply and demand based on having intelligent agents (buyers and sellers) working out the right price.

Gode and Sunder (1993) simulate markets in which:

- ▶ the agents have zero intelligence (random bidding)
- ▶ the only constraint is that they don't make money-losing bids
- ▶ nevertheless, the price converges towards the clearing price

The Market

- N buyers and sellers that need to get matched up
- simplification: each buyer / seller has one unit
- sellers have some distribution of costs in $[0, 100]$
- buyers have some distribution of redemption values in $[0, 100]$

Supply and Demand

- people willing to buy/sell at different prices
- market clearing = demand matches supply

```
1  N = 1000
2  costs = rand(N)**2 *100.0
3  redemptions = rand(N)**3*100.0
4  plot(sorted(costs))
5  plot(array(sorted(redemptions))[::-1])
```
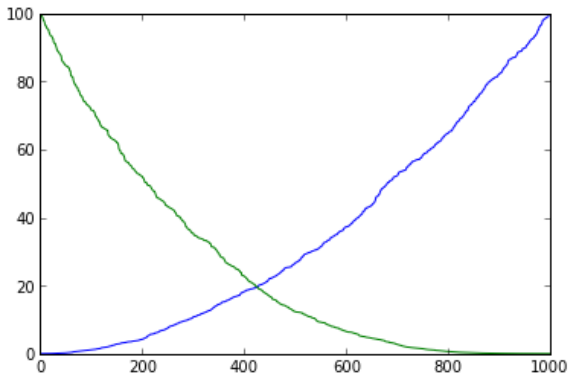
calculating the clearing price

```
1 nclearing = find ( array ( sorted ( costs ) ) >= array ( sorted ( redemptions ) )
      [ : : -1 ] ) [0]
2 print nclearing
3 clearing = sorted ( costs ) [ nclearing ]
4 print clearing
```

```
425
19.6304047106
```

Laws of supply and demand

- ▶ All else being equal, an increase in price results in an increase in quantity supplied-.
- ▶ All else being equal, as the price of a product increases, quantity demanded decreases.

Law of demand

- ▶ pretty robust law
- ▶ as prices get lower, there are more possible applications/uses
- ▶ as prices get lower, the good can be substituted for other goods
- ▶ exceptions:
- ▶ Giffen goods: as prices rise, less money for preferable alternatives
- ▶ Veblen goods: as prices rise, the good becomes more of a status symbol

Law of supply

- ▶ much more complicated
- ▶ short-term vs long-term
- ▶ short-term: increase production at single plant, idle single plant
- ▶ long-term: build new plants
- ▶ extractive industries
- ▶ easy vs difficult to extract resources
- ▶ efficiencies of scale
- ▶ with automation, making more reduces unit costs
- ▶ eventually, you run out of scarce resources
- ▶ eventually, **scarcity** (of people, raw materials, etc.) sets in no matter what

Double Auction with ZI Agents

Double Auction

- ▶ both buyers and sellers place bids in the auction
- ▶ buyers and sellers can alter their bids as the auction proceeds
- ▶ the auction is finished when the ask is below the bid
- ▶ double auctions are often used as model of market price finding mechanisms

Zero Intelligence Agents

- buyers bid random amount below their redemption value
- sellers bid random amount above their cost
- bids are only accepted if they actually increase the bid or decrease the ask

```
 1  sellers = set ( range ( N ))
 2  buyers = set ( range ( N ))
 3  transactions = []
 4  alltrans = []
 5  gain = 0
 6  for r in range ( N ):
 7      ask = 100.0
 8      seller = -1
 9      bid = 0.0
10      buyer = -1
11      last = -999
12      for r in range (100):
13          if rand () <0.5:
14              i = pyrand . sample ( sellers ,1) [0]
15              new_ask = rand () *(100 - costs [ i ]) + costs [ i ]
16              if new_ask < ask :
17                  ask = new_ask
18                  last = ask
19                  seller = i
20          else :
21              j = pyrand . sample ( buyers ,1) [0]
22              new_bid = rand () * redemptions [ j ]
23              if new_bid > bid :
24                  bid = new_bid
25                  last = bid
26                  buyer = j
27              if ask < bid :
```

double auction progress

```
1  from scipy.ndimage import filters
2  plot(transactions, alpha=0.3)
3  smoothed = filters.gaussian_filter(transactions, 30.0)
4  plot(smoothed)
5  print smoothed[-1]
```

14.8967415137
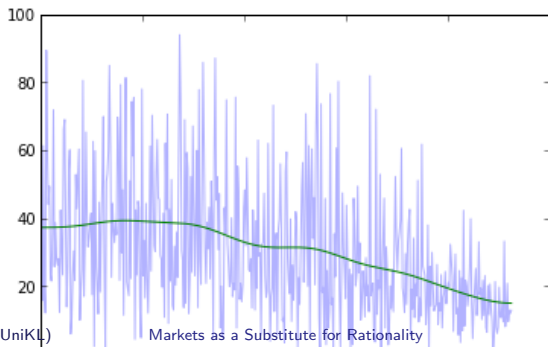
ZI Agents

- As the double auction proceeds, prices converge towards the market clearing price.
- Reason: extreme costs/redemptions are more likely to match early on in the auction.

Conclusion

The paper says:

- ▶ Markets tend towards clearing prices even in the absence of intelligence.

Questions:

- ▶ Does this really tell us about real market price mechanisms?
- ▶ Is this more of an oddity?
- ▶ What kinds of real-world markets does it describe?
- ▶ A lot of buyers/sellers are paying "the wrong price", what are the implications?