

MARKET STRUCTURE

CENTRALIZED VS. OVER-THE-COUNTER (“DARK”) MARKETS?

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Competitive Markets

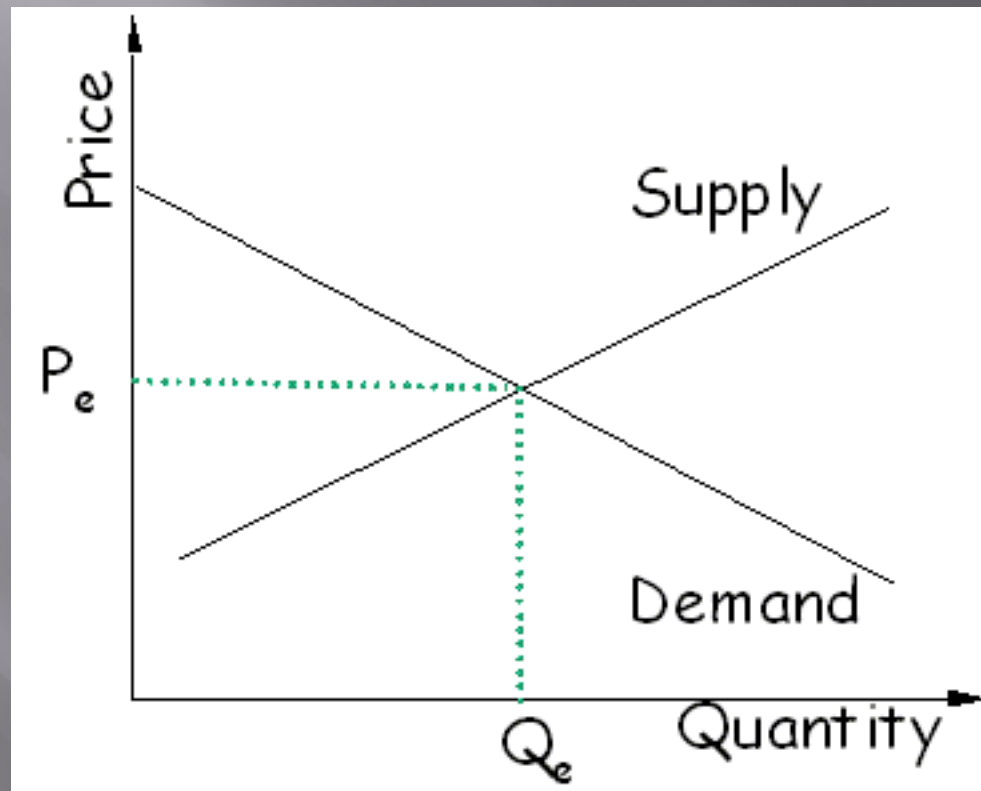
- ▣ Fundamental result in economics:
 - Competitive markets have an *equilibrium*: they settle
 - At this equilibrium, they provide optimal allocations*
- ▣ “Pareto optimality:” no re-arrangement is better because it hurts someone [“efficiency;” after Vilfredo Pareto, from Lausanne, Switzerland (1800s)]
- ▣ What are these competitive markets really?

*There are some conditions

The Theory

- ▣ Nobody on the demand *and* supply side can affect prices
- ▣ Announced prices are such that:
$$\text{DEMAND} = \text{SUPPLY}$$
- ▣ This is the competitive equilibrium
- ▣ A.k.a. *the Walrasian equilibrium*, after Léon Walras, from Lausanne (1800s)
- ▣ Sharp predictions about (net) *quantity that will be traded, who trades, and at what prices*

The Usual Plot:



Important Remark

- ▣ The theory is SILENT about
 - How to implement competitive markets
 - Specifically, how to get to equilibrium

So:

- ▣ When economists claim that “*markets always work best*”, they are really talking about the beautiful abstract constructions of the theory
- ▣ Whether a *given* market institution can be associated with the markets in the theory is not a foregone conclusion
- ▣ Unfortunately, many economists *believe* that any “free” (unregulated) market will do...

Are The Following Competitive Markets?

- ▣ *Ebay*: probably not, because it is *one-sided*
- ▣ *Treasury auctions*: same problem
- ▣ *OTC derivatives markets*: not everyone trades at the same price
- ▣ *Real estate market*: like the OTC markets?
- ▣ *The NYSE*: looks more like a competitive market

For Competitive Markets, We
Need, At A Minimum:

Price taking on both
demand and supply side

Important Remark

COMPETITIVE

≠

STRATEGIC

- ▣ *In fact, in a competitive situation, “strategy” (e.g., attempts to manipulate opponent) is not supposed to work!!*
- ▣ *Books like “Competitive Strategy,” like from one of my former colleagues at Yale, are a contradiction in terms!*

Here Is An Institution That Does Not Work

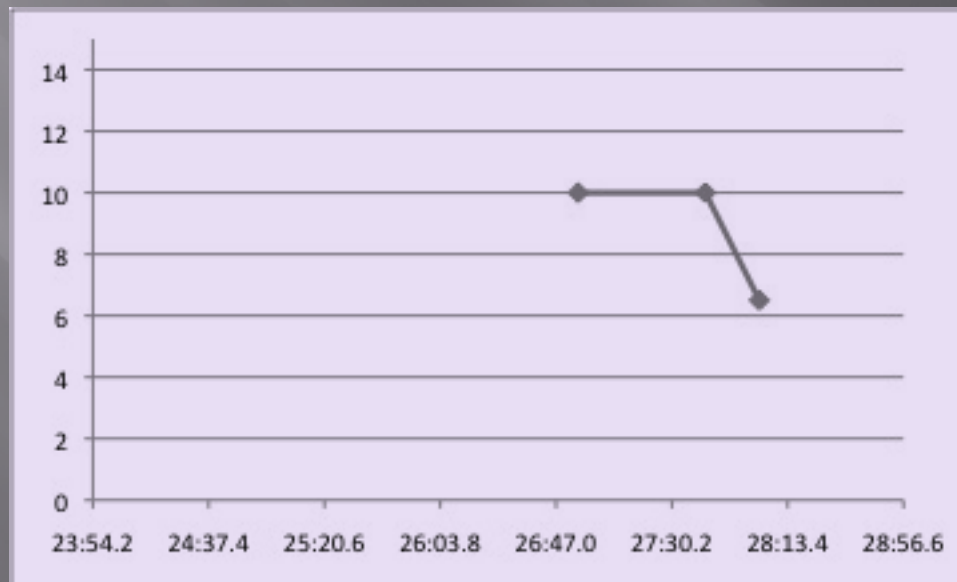
- ▣ Bilateral private markets
- ▣ E.g., 30 subjects meet in the “marketplace” to exchange securities for cash
- ▣ 15 have an incentive to sell (they pay us for every unit they sell and they keep the difference with the selling price)
- ▣ 15 have an incentive to buy (we pay them for every unit they buy and they keep the difference with the buying price)

Theoretical Predictions

- ▣ The competitive equilibrium price is ~ 10
- ▣ The (net) amount of optimal trade is 18
- ▣ This provides the *best* possible re-allocation of securities

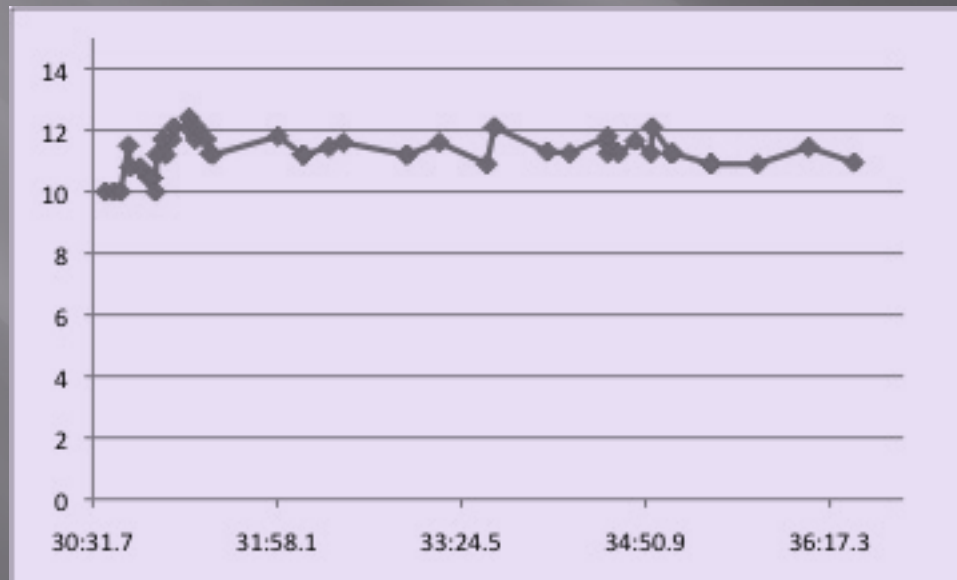
Outcome

- ▣ 3 trades (despite 178 orders!)
- ▣ Between the WRONG people
- ▣ And one at prices way off equilibrium level (to the delight of the counterparty, who should never have traded!)



We Know An Institution That Does Work

- ▣ Lots of trade
- ▣ *Net* trade ~18
- ▣ Prices slightly above predicted



We Used The Double Auction

- ▣ Centralized market
- ▣ Anonymous
- ▣ Double-sided: both buyers and sellers
- ▣ Our version: open *limit order* book
 - Orders for execution at indicated price or better
 - If no match, stay around until canceled or matched
 - Strict time/price priority imposed

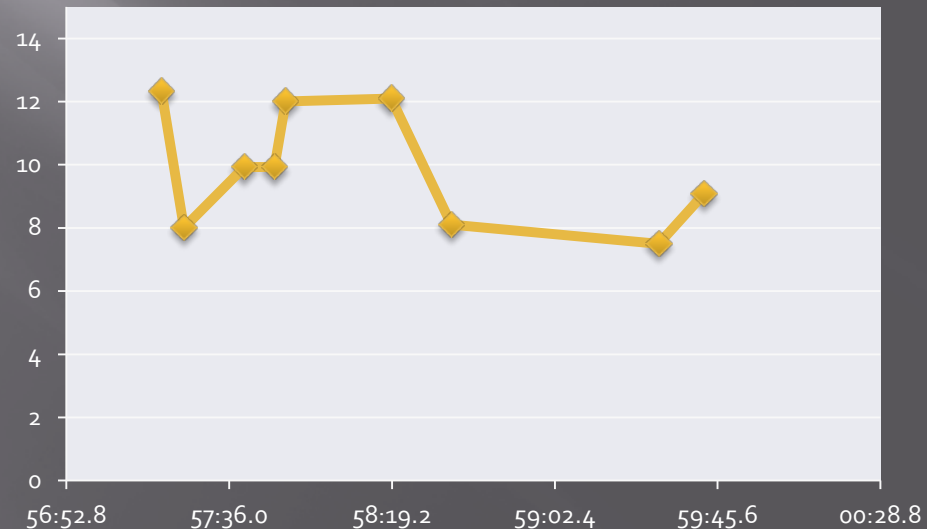
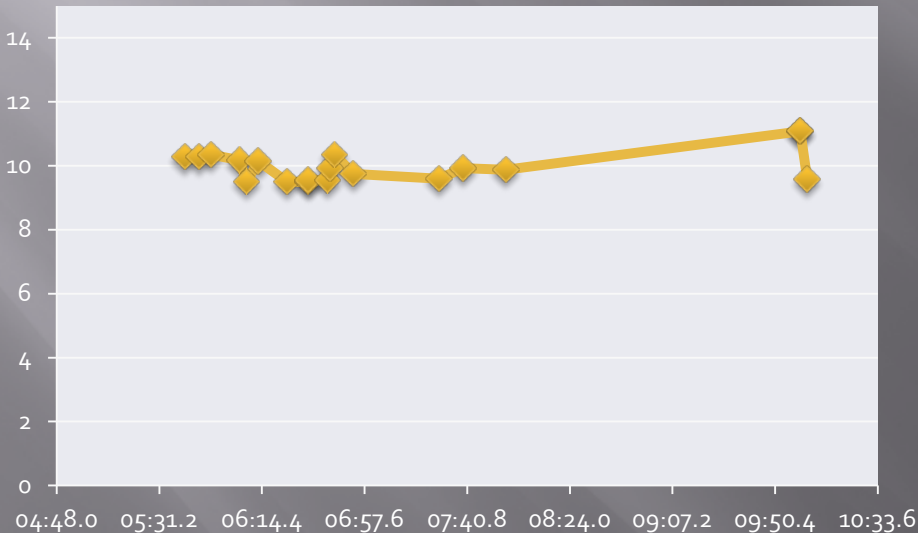
(This is Flex-E-Markets of course)

(This Experiment Is Part Of An MBA Class)

- ▣ A financial markets lab class (to be introduced at Melbourne soon)
 - Where we teach the theory of asset pricing using 7 canonical settings
- ▣ The outcomes on the previous slides are from a class at EPFL, Switzerland (Master of Financial Engineering)
- ▣ If you don't believe that this replicates, here is what happened at the Eccles School of Business, University of Utah, Fall 2013...
- ▣ (Experimentation is also about REPLICATION; standard empirical work in finance cannot be replicated because it concerns HISTORY)

(BTW, “Speculation” is allowed: buyers can sell and sellers can buy)

- Induced demand/supply, equilibrium price = 10
- Left: centralized; Right: decentralized
- (Are MBA students more active?)



Compare to single-sided auctions:

- ▣ Single seller makes it hard to analyze (Multiple units: Uniform price? Discriminatory price? Simultaneous or staggered auctions?...)
- ▣ Analyzed using game theory: not competitive, but *strategic*!
- ▣ Strategic equilibrium is not necessarily efficient (Pareto optimal)
- ▣ Often complex assignment rules (see next)

(First) Proposed Clearing Rules For FCC Spectrum Auctions

We have therefore chosen a method that attempts to balance minimizing the slack variables and reducing the fluctuations in pseudo-dual prices from round to round. This method requires solving two optimization problems, the first of which is alternative 3 above, which we present as (P4):

$$\begin{aligned}
 \Omega^* = \min \quad & \sum_{j \in B^t \setminus (W^t \cup F)} \delta_j \\
 \text{s.t.} \quad & \sum_{i \in L} a_{ji} \pi_i + \delta_j \geq b_j, \text{ for all } j \in B^t \setminus (W^t \cup F) \\
 \text{(P4):} \quad & \sum_{i \in L} a_{ji} \pi_i = b_j, \quad \text{for all } j \in W^t \\
 & \pi_i \geq b_j, \quad \text{for all } j \in F \setminus (W^t \cap F) \\
 & \quad \text{and } i \text{ is the license index associated with bid } j \\
 & \delta_j \geq 0, \quad \text{for all } j \in B^t \setminus (W^t \cup F)
 \end{aligned}$$

Since multiple optimal solutions can exist to (P4) we solve a second optimization problem that chooses a solution in a way that reduces the magnitude of price fluctuations between rounds.

Why Do 2-Sided Markets Work?

- ▣ They sometimes work with simple robots (Gode-Sunder)
- ▣ They work from ~10 participants on (5 on each side) (Vernon Smith, Charles Plott,...)
- ▣ Do not work because of Walras' conjecture that prices increase if there is excess demand and *v.v.* (Asparouhova-Bossaerts-Plott)
- ▣ Conjectured to work because participants make marginally optimal adjustments (Bossaerts-Ledyard)

From A Market Design Point Of View:

- ▣ Try to design claims so that problems can be solved with a double-sided market
- ▣ Implement the double-sided market as a centralized, anonymous open book system

Example: City Entry

- ▣ Every day permits to enter city center are available
- ▣ How to generate optimal allocation?
- ▣ One option: city office sets the price (Singapore)
- ▣ This is a single-sided auction

Alternative:

- ▣ Annual permits are distributed which can be sub-leased on a daily basis
- ▣ (Allocate permits to city center residents?)
- ▣ Double-sided market in daily entry permits:
 - Sellers: holders of annual permits
 - Buyers: don't hold annual permits but need a one-day permit

Conclusions

- ▣ The “markets” of economic theory are abstract concepts
- ▣ The theory gives little guidance as to how to implement them and ensure equilibration
- ▣ Some institutions work
- ▣ What distinguish these institutions is that they are centralized, and competitive on *both sides*:
Two-sided

Regulation

- ▣ ... Should be about *institutions* that are allowed
- ▣ So, about rules of exchange
- ▣ [Perhaps no dark pools, no private CDS markets?]
 - Dodd-Frank in US
 - MiFID 2 in EU
 - REALLY? Let's re-visit this in 2 weeks...