The Role of Financial Markets

- Resource allocation
- Return/risk allocation
- Prices offer information about prospects

**economic efficiency** relies on **prices** accurately reflecting available **information**
Transaction prices are negotiated through the mechanism of an exchange (expect strategic behavior and associated inefficiencies)
Rise of Electronic Exchanges

- Advances in IT make development easy
- Regulatory changes of 1990s enabled participation

- Instinet, Island, Archipelago, etc.
  - Took over > 50% of NASDAQ
  - Eventually acquired/merged into NASDAQ and NYSE

- New exchanges (e.g., in developing countries)

- Advantages
  - Lower transaction costs
  - Direct access (no front-running risk)
  - Anonymity
Limit Order Book

Bear Stearns
(last Friday)

sell orders

$31.05
$31.04
$31.03
$31.02
$31.01
$31.00
$30.99
$30.98
$30.97
$30.96
$30.95
$30.94
$30.93

buy orders

order placement
transaction
cancellation
Design Issues

• Tick size
  – Common Cents Act

• How much to reveal to the public?
  – Entire book?
  – Volume at best buy/sell prices?
  – Leave choice to participant?
    • Those who reveal get precedence in the queue

• Open/close times, interaction with other exchanges, impact of various policy decisions, etc.

• Current project: models/algorithms to assess market efficiency
  – Limit order data comes in terabytes
  – Counterfactual analysis
  – Stock Exchange of Thailand
Société Générale

- Discovery of €50B position
- Liquidated over January 21-23
- Received €45.1B

- Market impact
- Triggered emergency rate cut of January 22

“cracked under the pressure of a 30 hour work week”
Basic Execution Algorithm

• Spread trades out evenly over the time frame

• Optimal if (Bertsimas-Lo, 1998)
  – Nominal stock prices follow random walk
  – Market impact is linear in trade size and permanent
  – Objective = maximize expected expected revenue

\[ price_t = price_{t-1} + \gamma \text{trade}_t + \text{noise}_t \]
Resilience

• Market impact decomposition
  – Permanent
  – Transient

• Optimal execution
  (Obizhaeva-Wang, 2005)
  – Large trades at beginning and end of interval
  – Small trades in between

• Many other models
  – Each leads to a deterministic schedule
Arbitrageurs

• Problem with recognizable trading patterns

• Optimize while accounting for (Moallemi-Park-VR, 2007)
  – Market impact model
  – Presence of arbitrageur

• Algorithm for computing perfect Bayesian equilibrium
  – Generates stochastic schedules
  – See more in poster session…
The Market for Blind Baskets

• Shop around for a counterparty
  – Simultaneous need to buy?
  – Less urgency to liquidate?
  – Better execution technology?

• Information leakage impacts price
  – Only talk to a few potential counterparties
  – Give away as little information as possible

inability to share information can result in enormous inefficiency
Trusted Intermediary

seller

intermediary

buyer 1

buyer 2

buyer 3

buyer 4

all want to monitor

none want to reveal
Secure Computation

- Encrypt transmission to computer such that
  - Data only useful for determining buyer and price
  - No other inference is tractable

- Output encrypted so that
  - Only seller and buyer can recover price
  - Only seller knows which buyer

- There is technology for this…sort of

- More discussion in poster session…