



Predicting the Future: The Use of Prediction Markets in the Context of Labor Market Information

Joyce E. Berg
and
Thomas A. Rietz

The Tippie College of Business
University of Iowa



Outline

- What are prediction markets?
- Are prediction markets accurate?
- How can prediction markets be used in forecasting labor vacancies?



What Are Prediction Markets?

- Futures and options markets with
 - Payoffs tied to events of interest
 - Designed specifically to
 - Aggregate information
 - Forecast
- Example: The Iowa Electronic Markets (IEM)
 - www.biz.uiowa.edu/iem

Some Prediction Markets and Markets with Prediction Style Contracts

- Iowa Electronic Markets
 - www.biz.uiowa.edu/iem
- Hedge Street/North American Derivatives
 - www.nadex.com
- Chicago Board of Trade
 - www.cbot.com
- Chicago Mercantile Exchange
 - www.cme.com
- InTrade
 - www.intrade.com
- Cantor Fitzgerald / Hollywood Stock Exchange
 - <http://www.hsx.com/>
- ForeSight Exchange
 - www.ideosphere.com

Some Prediction Contracts

- Iowa Electronic Markets
 - Political
 - Federal Funds
 - Economic Indicators
 - Stock prices and Returns
 - Corporate Earnings
 - Movie Box Office Takes
 - Influenza
 - Hurricane landfall
 - IPOs
- Hedge Street/NADEX
 - Federal Funds Rates
 - CPI
 - Crude Oil and Natural Gas
 - Housing Prices
- Chicago Board of Trade
 - Federal Funds Rates
- Chicago Mercantile Exchange
 - Event (Landfall) Markets based on Carvill Hurricane Index (CHI)
 - Heating/Cooling Degree Days
 - Cumulative Average Temperature
 - Snowfall and Frost
- Cantor Fitzgerald / Hollywood Stock Exchange
 - Movie Box Office Takes
 - Other entertainment
- InTrade/ForeSight Exchange
 - Wide range

Example: 2008 IEM Presidential Markets

- Tied to Election Outcomes
- "Vote-Share" Market
 - UDEM08_VS
 - Pays \$1 x Democratic % of 2-party vote
 - UREP08_VS
 - Pays \$1 x Republican % of 2-party vote
- "Winner-Takes-All" (Binary Option) Market
 - DEM08_WTA
 - Pays \$1 if Democratic % of 2-party vote > 50%
 - REP08_WTA
 - Pays \$1 if Republican % of 2-party vote > 50%
- "Interval" (Binary Option) Market
 - DEM04_50-52
 - Pays \$1 if Democratic % of 2-party vote > 50% & ≤ 52%
 - Intervals span range

How do Prediction Markets Work? Mechanics

- **Traders**
 - Open account and
 - Place orders through the internet
- **Exchange**
 - Accepts orders in a time and price ordered queues
 - Clears trades when orders cross or are accepted
- **IEM allows traders to create contracts**
 - Unit portfolios (1 of each contract) can be purchased from or sold to exchange at any time
- **Market design may imply prices should equal expected outcome values**

How do Prediction Markets Work? Practice

- **Current laboratory and field work suggests the following avenues:**
 - Information sharing
 - Information aggregation
 - Information production
 - Dynamic feedback
 - Trader self-selection
 - Trader role selection

Are Markets Accurate

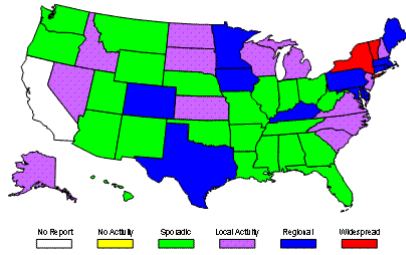
- **Evidence from IEM vote share market**
 - Point predictions of election vote share
- **Evidence from Flu prediction markets**
 - “Range” predictions of flu activity
- **Type of prediction determined by contract definition**

IEM Influenza Markets

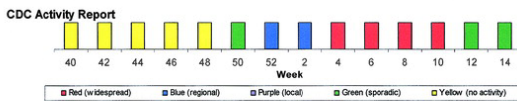
- CDC Reports Influenza Activity by State:
 - No Activity or Sporadic: White/Yellow
 - Sporadic: Green
 - Local: Purple
 - Regional: Blue
 - Widespread: Red
- Market forecasts CDC report
 - Importance of trader pool

Week 52 CDC Report

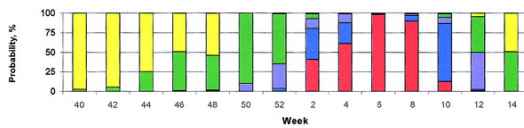
Weekly Influenza Activity Estimates Reported
by State & Territorial Epidemiologists
Week ending January 1, 2005 -Week 52



Influenza Markets: Contemporaneous Forecasts



Market Predictions, 0 Weeks in Advance



Source: Polgreen, Nelson & Neumann, "Use of Prediction Markets to Forecast Infectious Disease Activity," *Clinical Infectious Diseases* 2007, Jan 15;44(2):272-9.

IEM Election Market Distributions

- **IEM Election Markets**
 - Prices inconsistent with common distributional assumptions
 - Underlying distributions can exist, but not
 - Unimodal symmetric
 - Symmetric nor
 - Common parametric
- **Computational Method**
 - Non-parametric, Bayesian method for estimating distributions
- **Research Results**
 - Distributions are more informative than historical distribution, but precision may not increase over time
 - Mean shifted toward the outcome

Optimization & Constraints

- **Use combination of vote share and interval market prices**
 - constraints on CDF
- **Other constraints**
 - Smoothness
 - Compactness (concentration)
- **Result: quadratic programming problem**

Estimation Results

1992	1996
2000	2004

- **Asymmetries often exist**
 - Often required to fit otherwise “inconsistent” prices across contracts
- **Multiple modes often exist**
- **Distributions change across time at variable rates**
- **Means of the estimated distributions**
 - Shift toward outcome if outcome differs from mean of historical prior
- **Volatilities of the estimated distributions**
 - Are generally (but not always) lower than historical prior
 - Often approach the theoretical lower bound
 - Are more stable than logistic normal implied volatilities
 - But, show no general tendency to fall across time

Labor Vacancy Markets The Big Picture

- What information is valuable?
 - Changes/improves decisions
 - More timeliness desired
 - More accuracy desired
- Who has that information?
 - Dispersion versus concentration
- Is information well defined enough to write a contract?
 - Fact versus opinion

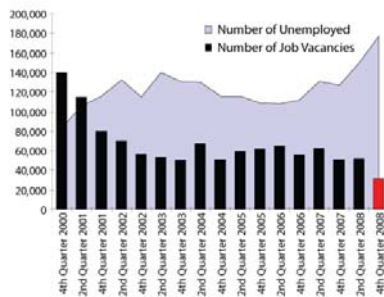
Labor Vacancy Markets Market Prototype

- Information
 - Overall vacancies one year out
 - Breakdown by job category
- Traders
 - Major employers, placement agencies, training agencies
- Payoff Basis: Minnesota Labor Vacancy Survey

Job Vacancies in MN

Source: Minnesota Job Vacancy Survey
<http://www.deed.state.mn.us/mti/publications/jobvacancy.htm>

Figure 1: Job Vacancies in Minnesota by Quarter



Labor Vacancy Market Job Vacancies in MN at June 2010

<u>Contract</u>	<u>Payoff</u>
	Vacancies are in the range
MN_LT25	Fewer than 25K
MN_25-35	Between 25K and 35K
MN_35-45	Between 35K and 45K
MN_45-55	Between 45K and 55K
MN_GT55	Greater than 55K

Percent Vacancies by Occupation

Figure 2: Minnesota Job Vacancies by Industrial Division, Fourth Quarter 2008



Labor Vacancy Market Percent Vacancies by Occupation

<u>Contract</u>	<u>Payoff</u>
	Percent of total vacancies represented by:
MN_HC	Health Care & Social Asst.
MN_Retail	Retail Trade
MN_Food	Accommodation & Food Serv.
MN_C&M	Construction & Manufacturing
MN_Other	All other jobs

Alternate Labor Vacancy Market Percent Vacancies by Occupation

Contract

MN_Nurse
MN_OtherHC
MN_Office
MN_Const
MN_Other

Payoff

Percent of total vacancies
represented by:

Nursing
Other healthcare
Office work
Construction
All other jobs

Issues

- Would this combination of markets be valuable?
 - What would be more valuable
- Is the time horizon about the right length?
- Who has pieces of this information early?
 - Are they willing traders?
- What exactly do prices mean?
