

BEHAVIORAL ECONOMICS AND PREDICTION AND BETTING MARKETS

Motivation

This class considers an intriguing – and growing – set of non-traditional markets, including trading (or gambling) on the outcome of sporting events, elections, political risks, corporate outcomes, public policy and economic statistics. We will explore these markets, drawing on insights from economics and psychology, and highlighting the parallels between these markets and other existing markets.

For the first half of the class we will survey the literature on Prediction Markets. Ongoing innovations in prediction markets have yielded new securities tied to the outcomes of economic, corporate and public policy outcomes. We will examine the potential uses of these markets in the business and public policy domains. Importantly, the success of these markets depends on whether these markets yield efficient forecasts, which in turn depends on factors such as market design, and the biases exhibited by individual traders.

As such, in the second half of the class we will examine a particular set of prediction markets in depth: sports betting. We begin by highlighting the analogy between betting on the ballgame, gambling at the ponies and purchasing stock in your favorite firm on the NYSE. We then turn to discussing recent advances in behavioral economics and attempt to apply psychologically-grounded theories of information processing to sports betting. Assessing potentially profitable trading strategies with a critical eye, we will discuss not only investment opportunities, but what these findings reveal about both human psychology and the operation of markets.

Course Credit: This is an MBA elective class, and counts as a BPUB field course. Under no circumstances will it count towards meeting a concentration in another field. This class cannot be taken pass/fail.

Obligations

Attendance: Attendance at each and every class session is mandatory. Two unexplained absences may – without cause – be sufficient for a failing grade. Exceptions *may* (rarely) be possible if cleared with me *in advance*.

Preparation: You are expected to have thoroughly read the assigned readings before class.

Participation: You will be expected to participate meaningfully and even vigorously in the classroom, and also to engage the quantitative part of the course seriously.

Research Project

This course aims to extend theory into practice, and hence students will divide into research teams to try to test our theories based on available data. I have data available for teams to work on for the following sports (other ideas are feasible, but must be discussed in advance):

- NFL Football
- NCAA Football
- NBA Basketball
- NCAA Basketball
- MLB Baseball (both AL and NL)
- NHL Hockey
- British Soccer
- European Soccer
- Horse Racing
- Tennis (ATP)
- Politics
- NASCAR

Additionally (or alternatively), there may be an opportunity to organize your research project around a question directly related to Professor Wolfers' ongoing research in this field.

In order to enjoy the returns to specialization, I will ask each of you to choose a sport or research project, and to make that sport the focus of your empirical work. Students who are sharing a focus on a particular sport are encouraged to work together as a research team. Teams should consist of between three and five students.

Each research team is to analyze the historical data for their chosen sport, in an effort to find evidence of profitable trading strategies, suggested by our readings in psychology. I shall provide the relevant data.

Importantly, your analysis should provide a psychological foundation for the hypotheses you test. (You should plan on testing several hypotheses.) Test the success of these betting strategies on your data, providing both general tests of robustness, and tests of statistical significance. Remember, evidence that the market efficiently prices in some information is just as useful as evidence of mispricing (although unfortunately, this knowledge will never make you rich).

The main output from this project will be a fifteen minute in-class presentation of your major findings. Students are encouraged to use PowerPoint for this presentation, and to prepare handouts to outline their findings. Expect to take questions from the room, but please respect the time limit.

Specific Deliverables

- Session 6: Research teams must be finalized by 7pm on the evening following class. Let me know who is in your research team, and what sport or research question your team will be analyzing. I will then send you the data you need.
- Session 8: Each research team to send me a one-page summary of your proposed research project, outlining research questions to be investigated, the data you will analyze, and the research methods you propose using. The key at this point is to make the case that your research projects will be both *feasible* and *interesting*. This proposal is due by 9pm on the evening following class.
- Sessions #9 and 10: Oral report and four pages summarizing and critiquing relevant articles.
- Sessions #11 and 12: Presentation of major project.

Grading

Your grade will reflect:

- Major project: 50%. Includes both the final project, and your research plan.
- Class participation: 50%. Includes in-class presentations as well as participation in class discussion.

1. PREDICTION MARKETS

1.A Lecture: Introduction and Motivation

- Welcome and introduction
- Syllabus overview
- Discussion of research projects

1.B Discussion: Prediction Markets

We will discuss the following two papers:

Reading #1: Justin Wolfers and Eric Zitzewitz, "Prediction Markets", Journal of Economic Perspectives, 18(2), Spring 2004. (Available at: <http://bpp.wharton.upenn.edu/jwolfers/Papers/Predictionmarkets.pdf>)

Reading #2: "Guessing Games", Economic Focus Column, The Economist, November 18, 2004. (Available at: [http://bpp.wharton.upenn.edu/jwolfers/Press/Mentions/GuessingGames\(TheEconomist\).mht](http://bpp.wharton.upenn.edu/jwolfers/Press/Mentions/GuessingGames(TheEconomist).mht))

Discussion Questions

- Why do prediction markets yield relatively accurate forecasts?
- When might we expect prediction markets to be accurate, and when might we expect them to be inaccurate?
- Can you think of potential uses for prediction markets within businesses, financial firms, or the government? Are there ways in which prediction markets may have helped your firm in your previous job? Is there a "killer application" that is yet to be tested?
- Are there alternative mechanisms that might yield equally accurate forecasts?

2. PREDICTION MARKETS: THEORY

Reading #3: Justin Wolfers and Eric Zitzewitz, "Interpreting Prediction Market Prices as Probabilities", NBER Working Paper #12200. <http://bpp.wharton.upenn.edu/jwolfers/Papers/InterpretingPredictionMarketPrices.pdf>

Reading #4: Justin Wolfers and Eric Zitzewitz, "Five Open Questions About Prediction Markets", in Hahn and Tetlock (eds), "Information Markets: A New Way of Making Decisions in the Public and Private Sectors". [http://bpp.wharton.upenn.edu/jwolfers/Papers/FiveQuestions\(book\).pdf](http://bpp.wharton.upenn.edu/jwolfers/Papers/FiveQuestions(book).pdf)

Discussion Questions

- Do we expect the relationship between prediction market prices and actual probabilities to be distorted by a risk premium? Is this premium likely to be large or small? Why?

- An example may help (work through this prior to class): Your wealth is \$100,000, and you believe that the Democrats are a 50% chance to win the next election. How much an expected utility maximizer be willing to pay for a security that pays \$1000 if they win the next election?
 - If you are risk neutral
 - If you have log utility $U(\text{wealth}) = \ln(\text{wealth})$
 - If you have CRRA preferences: $U(\text{wealth}) = \text{Wealth}^{1-\rho} / (1-\rho)$
 - If $\rho=4$ (a reasonable estimate for many risk averse people)
 - If $\rho=20$ (an incredibly risk-averse level; needed to reconcile the equity premium puzzle)
- Are there particular market designs that are more or less likely to generate useful forecasts?
- What is the correlation v. causation concern described in reading #4? How might we address these concerns?

3. APPLICATIONS OF PREDICTION MARKETS TO BUSINESS AND PUBLIC POLICY

Reading #5: Robin Hanson, “Decision Markets for Policy Advice”, in Alan S. Gerber and Eric M. Patashnik (eds), “Promoting the General Welfare: New Perspectives on Government Performance,” Brookings Institution Press, 2006. <http://www.aei-brookings.org/publications/abstract.php?pid=1111>

Reading #6: Rachel King, “Workers, Place Your Bets”, *Business Week*, August 3, 2006. http://www.businessweek.com/technology/content/aug2006/tc20060803_012437.htm

Reading #7: Cass R. Sunstein, “Deliberation and Information Markets”, in Hahn and Tetlock (eds), “Information Markets: A New Way of Making Decisions in the Public and Private Sectors”. <http://www.aei-brookings.org/admin/authorpdfs/page.php?id=1307>

Discussion Questions

- What sorts of issues could prediction markets help corporations address?
- What sorts of issues could prediction markets help public policymakers address?
- Who within an organization is likely to be empowered by prediction markets? And who is likely to feel threatened?
- What are some of the implementation problems one might encounter when establishing a corporate prediction markets?
- Would you expect to encounter resistance within your firm in establishing a prediction market? Why?
- What are some possible solutions to these implementation, political and regulatory issues?

4. PREDICTION MARKET RESEARCH

Details of this session to be announced.

Note the substantial reading load for our sessions 5 and 6. Start now.

5. SPORTS BETTING: UNDERSTANDING THE INSTITUTIONS

5.A Sports Bookmakers

Reading #8: "Race and Sports Book Management: A Guide for the Legal Bookmaker" by Michael Roxborough and Mike Rhoden, Las Vegas Sports Consultants

You are to read this entire book (126 pages), although you should use your judgment in deciding which bits to skim and which to pore over. (Interestingly enough, this is the assigned textbook in the nation's only college course for aspiring bookmakers – a course taught at Clark County Community College.)

Aims:

- Understand the types of wagers that are offered on different sports
- Understand how bookmakers set odds
- Understand the institutions involved in betting markets
- An introduction to some of the mathematics of sports betting

The material in this book will be assumed knowledge for the rest of the course, so if it raises any unresolved questions for you, please note your questions in WebCafe so that relevant issues can be integrated into the class plan.

5.B. Illegal Bookmakers

Reading #9: "Illegal Sports Bookmakers", Kolemian Strumpf (mimeo, UNC Chapel Hill, February 2003) Also available at: <http://www.unc.edu/~cigar/papers/Bookie4b.pdf>.

Class discussion question:

- How does the illegal betting market differ from the legal betting market?

5.C Online Gambling

Web research: Visit several sports books online, and get a sense of how they work, what sports they bet on, and what wagering facilities are available.

Some suggestions:

- www.bodog.com: An example of one of (many!) online bookmakers.
- www.betfair.com: A rather unique two-sided betting forum. No bookmaker is involved; rather the site matches those wanting to wager for a team with those wanting to wager against. This firm was started by a Wharton alum.

- www.intrade.com: An interesting “trading exchange”, whose offerings extend beyond sports to include politics, current events, individual stocks and futures.
- www.biz.uiowa.edu/iem/: Iowa electronic stock market: Betting on elections: A so-called “electronic stock market”, allowing one to bet on elections, Federal Reserve policy, movie releases and a range of other events.
- www.oddschecker.com: Shows current betting information across several books.

Class discussion questions:

- Do you observe difference in the odds offered across websites?
- Do you have a sense that some of these betting venues are more likely to be efficient than others?
- Any interesting observations about what is being bet on, and the types of bets that are offered?

6. INSIGHTS FROM PSYCHOLOGY AND EXPERIMENTAL ECONOMICS

Reading #10: “*The Hot Hand in Basketball: On the Misperception of Random Sequences*”, by Tom Gilovich, Robert Vallone and Amos Tversky, *Cognitive Psychology*, 17, 295-314 (1985) and reprinted in “*Heuristics and Biases: The Psychology of Intuitive Judgment*”, edited by Tom Gilovich, Dale Griffin and Daniel Kahneman (Cambridge University Press, 2002)

This paper serves as a simple introduction to how human psychology can lead to mistake inference which may ultimately distort market prices. The paper highlights perception errors suggested by the psychology literature, documents that they affect our perception of sports contests, and even suggests that this might yield profitable betting strategies.

Reading #11: “*Heuristics and Biases*”, Amos Tversky and Daniel Kahneman, *Science* 1974, 185, 1123-1131. Available at: <http://links.jstor.org/sici?sici=0036-8075%2819740927%293%3A185%3A4157%3C1124%3AJUUHAB%3E2.0.CO%3B2-M>

This is the seminal article by the two leading psychologists, reporting on a range of decision problems that yield behaviors contrary to the standard (rational) economics paradigm. The behaviors that they discuss have since been confirmed in hundreds of experiments over the ensuing 25 years.

Reading #12: “*Judgment in Managerial Decision Making*”, by Max Bazerman (5th ed., 2002). Chapters 1-3 (pp.1-58)

This article provides an accessible and up-to-date treatment of recent research on heuristics and biases. Read these chapters to get a sense of the evidence on the types of “mistakes” that people make when confronting tough decision problems.

Class discussion questions:

- We will begin class with an experiment. Be prepared to bet on your judgment against Professor Wolfers
- What are the main biases that psychologists have documented regarding individual decision-making?
- What are the psychological foundations of these biases, and their real-world implications?
- In particular, which heuristics and biases do you think will be particularly relevant when people are betting on sports?
- Does this psychological evidence suggest to you any possible avenues to explore when looking for profitable trading strategies in sports betting markets (or financial markets more broadly)?

7. COMPUTER LAB SESSION: TESTING THE EFFICIENT MARKETS HYPOTHESIS

Note: We will be meeting in one of the computer labs.

7.A A Refresher on the Efficient Markets Hypothesis

Reading #13: “*The Efficient Market Hypothesis*”, by Burton Malkiel in “*The New Palgrave Dictionary of Economics*”

You should already have been exposed to the efficient markets paradigm in Finance. This short reading is just to remind you of the basic concepts.

Learning objectives:

- Understand that the efficient market hypothesis suggests that stock price movements are not predictable on the basis of publicly available information. (More formally, excess returns to holding stocks should not be predictable.)
- Distinguish between weak, semi-strong and strong-form versions of market efficiency.
- What are the assumptions underpinning the efficient markets hypothesis?

Class discussion questions:

- Is the efficient markets hypothesis likely to be applicable to sports betting markets?
- What is the sports betting analogy of the random walk hypothesis?
- How might we test for market efficiency in the sports betting context?

7.B Econometrics: Testing the Efficient Markets Hypothesis

How do you (statistically) test for efficient (or inefficient) markets?

Prior to class you should review your notes on linear regression from STAT 621.

I will lecture on applying the following concepts to our data

- Confidence intervals
- Standard errors
- Binomial distribution
- Hypothesis testing
- Strict efficiency v. Non-strict efficiency
- Multiple regression
- Linear probability model
- Dummy variables

7.C Practical Application: Is there a Favorite-Longshot Bias?

The purpose of this computer lab session is to ensure that each team is comfortable working with the data for their chosen sport. You are expected to sit together and research whether markets meet a simple test of weak-form efficiency:

- Are there different rates of return to betting on the favorite v. longshot
- Can this difference be exploited for profit?

8. INSIGHTS FROM BEHAVIORAL ECONOMICS: PSYCHOLOGY MEETS THE MARKET

Reading #13: “Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing”, by Hersh Shefrin (2000, HBS Press), Chapters 1, 4, 5, 7, 8.

These chapters provide a useful introduction and survey of the modern behavioral finance literature. These chapters will present a view of behavioral finance that sometimes feels quite piecemeal – a natural reflection of the current state of the field. As you read these papers, try to draw analogies from the financial market implications to possible implications for sports betting and prediction markets.

Reading #14: “The Efficient Market Hypothesis and Its Critics”, by Burton Malkiel (2003), Journal of Economic Perspectives 17(1).

This article counters the behavioral interpretation of many of the phenomena discussed by Shefrin, arguing that they are compatible with market efficiency. By making the standards of proof clearer, Malkiel provides guidance for empirical work on market (in)efficiency.

Class discussion questions:

- Which anomalies identified in the behavioral economics literature do you think have analogies in the prediction and sports betting markets?
- Does Malkiel’s critique have implications for how we should approach our research on sports betting?
- What profitable trading strategies do these readings suggest are worth exploring in the sports betting arena?

9 & 10. BEHAVIORAL SPORTS BETTING

These two sessions will be structured a little differently.

All students read a common background piece:

Reading #15: Donald Hausch and William Ziemba “Efficiency of Sports and Lottery Betting Markets”, Chapter 18, Handbooks in Operations Research and Management Science, Vol. 9 (Elsevier: 1995)

The strength of this reading is that it provides a comprehensive and relatively up-to-date summary of the sports betting literature. (The weakness is an overly strong focus on horse racing markets.)

Because much of the existing literature is so piecemeal, I will ask you to form pairs, and each pair will have responsibility for one of the topics below. Each examines a specific aspect of sports betting or prediction markets. Most topics involve two readings from the literature. You will be responsible for:

- Reading the articles carefully and critically
- Preparing a five-minute presentation that contains an interesting analysis of your two articles. (You do not need to give each paper equal weight, and should use your judgment.) Remembering that your classmates will not have read these article, ensure that your discussion:
 - Makes the research question clear
 - Provides a useful motivation for the paper
 - Summarizes and synthesizes the main points
 - Highlights conceptual or technical innovations in the paper.
 - Provides critical analysis – of both conceptual and technical issues.
 - Finds commonalities, points of difference, or argument between the two papers (if applicable)
 - Be prepared to take a couple of questions on your presentation.
- Provide a two page executive summary of each article. You may choose to include relevant tables or charts from the paper. (Very short articles may not require two pages to summarize; if you have only one paper, then three pages may be appropriate.)

Copies of the following articles will be available from Professor Wolfers. Remember, you only need to read those assigned to you.

Sign up for your topic using WebCafe; signups will open on March 31.

10.A Sports Betting: Themes Across Sports

10A.i Microeconomic theory and gambling: A survey

Sauer, Raymond D. (1998) "The Economics of Wagering Markets", *Journal of Economic Literature* 36, 2021-2064.

<http://links.jstor.org/sici?sici=0022-0515%28199812%2936%3A4%3C2021%3ATEOWM%3E2.0.CO%3B2-B>

10.A.ii Home Field Advantage

Vergin, R.C. and Sosick, J.J. (1999) "No Place Like Home: An Examination of the Home Field Advantage in Gambling Strategies in NFL Football", *Journal of Economics and Business* 51, 21-31.

Gandar, J.M., Zuber, R.A., & Lamb, R.P (2001) "The Home Field Advantage Revisited: A Search for the Bias in Other Sports Betting Markets" *Journal of Economics and Business* 53, 439-453. [Covers NBA and MLB]

10.A.iii Price Fluctuations

Avery, C. and Chevalier, J. (1999), "Identifying Investor Sentiment from Price Paths: the case of football betting", *Journal of Business*, 72 (4), 493-521.

<http://links.jstor.org/sici?sici=0021-9398%28199910%2972%3A4%3C493%3AII SFPP%3E2.0.CO%3B2-W>

Schnytzer, Adi and Yuval Shilony (1995), "Inside Information in a Betting Market", *Economic Journal* 105(431) 963-971.

<http://links.jstor.org/sici?sici=0013-0133%28199507%29105%3A431%3C963%3AIII ABM%3E2.0.CO%3B2-8>

10.B NBA Basketball

10.B.i The Hot Hand in Basketball

Camerer, C. (1989), 'Does the Basketball Market Believe in the "Hot Hand"?' *American Economic Review*, 79, 1257-61.

<http://links.jstor.org/sici?sici=0002-8282%28198912%2979%3A5%3C1257%3ADTBMBI%3E2.0.CO%3B2-%23>

Brown, W.O. and Sauer, R.D. (1993), 'Does the Basketball Market Believe in the Hot Hand? Comment', *American Economic Review*, 83 (Dec.), 1377-86.

<http://links.jstor.org/sici?sici=0002-8282%28199312%2983%3A5%3C1377%3ADTBMBI%3E2.0.CO%3B2-C>

10.B.ii Basketball Market Efficiency

Brown, William O. and Raymond D. Sauer (1993), “Fundamentals or Noise? Evidence from the Professional Basketball Betting Market”, *Journal of Finance* 48(4), 1193-1209.
<http://links.jstor.org/sici?sici=0022-1082%28199309%2948%3A4%3C1193%3AFONEFT%3E2.0.CO%3B2-W>

Sauer, Raymond D. (1998) “Player Injuries and Price Responses in the Point Spread Wagering Market”, *mimeo* Clemson University.
<http://hubcap.clemson.edu/~sauerr/work/injury.pdf>

10.C College Basketball

10.C.i Point Shaving in College Basketball

Wolfers, Justin (2006), “Point Shaving: Corruption in NCAA Basketball”, *American Economic Review*, 96(2).
<http://bpp.wharton.upenn.edu/jwolfers/Papers/PointShaving.pdf>

Bernhardt, Dan and Steven Heston (2006), “No Foul Play: Honesty in College Basketball”, *mimeo*, University of Illinois.
<https://netfiles.uiuc.edu/danber/www/bernhardt/pointshaving.pdf>

10.C.ii March Madness and Bracket-ology

Metrick, Andrew (1996) “March madness? Strategic behavior in NCAA basketball tournament betting pools”, *Journal of Economic Behavior & Organization* 30(2), 159-172.
<http://www.ingentaconnect.com/content/els/01672681/1996/00000030/00000002/art00855>

Niemi, Jarad B., Bradley P. Carlin and Jonathan M. Alexander (2005) “Identifying and Evaluating Contrarian Strategies for NCAA Tournament Pools”, *mimeo*, University of Minnesota
<http://www.stat.duke.edu/~jbn9/papers/nca.pdf>

10.D NFL Football

10.D.i NFL: Market structure and efficiency

Levitt, Steven (2003) “How do Markets Function: An Empirical Analysis of Gambling on the National Football League.” NBER Working paper No. 9422.
<http://www.src.uchicago.edu/users/levit/w9422.pdf>

10.D.ii NFL Football Market Efficiency

Dana, J.D. and Knetter, M.M. (1994), "Learning and Efficiency in a Gambling Market", *Management Science* 40(10)

<http://links.jstor.org/sici?sici=0025-1909%28199410%2940%3A10%3C1317%3ALAEIAG%3E2.0.CO%3B2-T>

Gray, Philip K. and Stephen F. Gray (1997), "Testing Market Efficiency: Evidence From the NFL Sports Betting Market", *Journal of Finance* 52(4), 1725-1737.

<http://links.jstor.org/sici?sici=0022-1082%28199709%2952%3A4%3C1725%3ATMEEFT%3E2.0.CO%3B2-M>

10.D.iii NFL: Modeling Fundamentals

Zuber, Richard A., John M. Gandar and Benny D. Bowers (1985) "Beating the Spread: Testing the Efficiency of the Gambling Market for National Football League Games", *Journal of Political Economy* 93(4), 800-806.

<http://links.jstor.org/sici?sici=0022-3808%28198508%2993%3A4%3C800%3ABTSTTE%3E2.0.CO%3B2-2>

Sauer, Raymond D., Vic Bajer, Stephen P. Ferric and M. Wayne Marr (1988), "Hold Your Bets: Another Look at the Efficiency of the Gambling Market for National Football League Games", *Journal of Political Economy* 96(1), 206-213.

<http://links.jstor.org/sici?sici=0022-3808%28198802%2996%3A1%3C206%3AHYBALA%3E2.0.CO%3B2-A>

10.D.iv NFL: Further analysis

Golec, J. and M. Tamarkin (1991) "The Degree of Inefficiency in the Football Betting Market", *Journal of Financial Economics* 30(2), 311-323

Gandar, John, Richard Zuber, Thomas O'Brien and Ben Russo (1988) "Testing Rationality in the Point Spread Betting Market", *Journal of Finance* 43(4) 995-1008.

<http://links.jstor.org/sici?sici=0022-1082%28198809%2943%3A4%3C995%3ATRITPS%3E2.0.CO%3B2-2>

10.E Major League Baseball

10.E.i Favorite-Longshot Bias: Baseball

Woodland, Linda and Bill Woodland (1994), "Market Efficiency and the favourite-longshot bias: the baseball betting market", *Journal of Finance*, 49, 269-280.

<http://links.jstor.org/sici?sici=0022-1082%28199403%2949%3A1%3C269%3AMEATFB%3E2.0.CO%3B2-7>

Gandar, J.M., Richard Zuber, R. Johnson and W. Dare (2002), "Re-examining the betting market on Major League Baseball games: is there a reverse favourite-longshot bias", *Applied Economics* 34(10), 1309-1317.

<http://cherubino.catchword.com/vl=1146031/cl=36/nw=1/fm=docpdf/rpsv/catchword/rouhledg/00036846/v34n10/s11/p1309>

10.E.ii The Progress of a Baseball Game: Scores and Odds

Lindsey, G.R. 1961, "The Progress of the Score During a Baseball Game", *Journal of the American Statistical Association*, 56(295), 703-728.

<http://links.jstor.org/sici?sici=0162-1459%28196109%2956%3A295%3C703%3ATPOTSD%3E2.0.CO%3B2-G>

Hakes, Jahn, Raymond D. Sauer and J. Kerry Waller 2005, "The Progress of the Betting in a Baseball Game", *mimeo*, Clemson University.

<http://hubcap.clemson.edu/~sauerr/working/game6.pdf>

10.F Soccer

10.F.i Soccer Market Efficiency

Cain, M., Law, D. and Peel, D. (2000) The Favourite-Longshot Bias and Market Efficiency in UK Football Betting, *Scottish Journal of Political Economy*, 47(1), pp. 25-36.

Pope, Peter F. and David A. Peel (1989) "Information, Prices and Efficiency in a Fixed-Odds Betting Market", *Economica* 56(223)

<http://links.jstor.org/sici?sici=0013-0427%28198908%292%3A56%3A223%3C323%3AIPAIEA%3E2.0.CO%3B2-6>

10.G Horse Racing

10.G.i The Favorite-Longshot Bias in Horseracing

Snowberg, Erik and Justin Wolfers (2005), "Understanding the Favorite-Longshot Bias: Risk Preferences versus Misperceptions", *Handbooks of Finance*.

Thaler, Richard and William Ziemba (1988), "Parimutuel Betting Markets: Racetracks and Lotteries", *Journal of Economic Perspectives* 2(2), 161-174.

<http://links.jstor.org/sici?sici=0895-3309%28198821%292%3A2%3C161%3AAPBMRA%3E2.0.CO%3B2-S&origin=bc>

10.G.ii Can Betting Markets be Manipulated?

Camerer, Colin F. (1998) "Can Asset Markets Be Manipulated? A Field Experiment with Racetrack Betting", *Journal of Political Economy* 106(3), 457-482.

<http://links.jstor.org/sici?sici=0022-3808%28199806%29106%3A3%3C457%3ACAMBMA%3E2.0.CO%3B2-U>

10.G.iii Cross-pool arbitrage

Asch, P. and Quandt, R.R. (1987) "Efficiency and Profitability in Exotic Bets", *Economica*, 54(215), 289 -298.

<http://links.jstor.org/sici?sici=0013-0427%28198708%292%3A54%3A215%3C289%3AEAPIEB%3E2.0.CO%3B2-F>

Thaler, Richard and William Ziemba (1988), "Parimutuel Betting Markets: Racetracks and Lotteries", *Journal of Economic Perspectives*, Spring 1988, 2(2), 161-174.

<http://links.jstor.org/sici?sici=0895-3309%28198821%292%3A2%3C161%3AAPBMRA%3E2.0.CO%3B2-S>

10.H Other Sports

10.H.i Sports Betting Market Efficiency

Woodland, Linda and Bill Woodland (2001) "Market Efficiency and Profitable Wagering in the National Hockey League: Can Bettors Score on Longshots?" *Southern Economic Journal* 67(4), 983-995.

Brailsford, T.J., Gray, P.K., Easton, S.A., & Gray, S.F., "The Efficiency of Australian Football Betting Markets" *Australian Journal of Management*, 1995.

<http://www.agsm.unsw.edu.au/eajm/9512/pdf/gray.pdf>

10.I Other Gambling Domains

10.I.i Game Shows

Metrick, Andrew (1995) "A Natural Experiment in 'Jeopardy!'", *American Economic Review* 85(1) 240-253.

<http://links.jstor.org/sici?sici=0002-8282%28199503%2985%3A1%3C240%3AANEI%22%3E2.0.CO%3B2-O>

Oberholzer-Gee, Felix, Joel Waldfogel and Matthew White (2003), "Social Learning and Coordination in High-Stakes Games: Evidence from *Friend or Foe*", NBER Working Paper #9805

<http://bpp.wharton.upenn.edu/waldfogel/pdfs/fof.pdf>

10.J Prediction Markets

10.J.i Iowa Electronic Markets

Berg, Joyce, Robert Forsythe, Forrest Nelson and Thomas Rietz (forthcoming), "Results from a Dozen Years of Election Futures Markets Research", in Plott and Smith (eds), *Handbook of Experimental Economic Results*

<http://www.biz.uiowa.edu/faculty/trietz/papers/iemresults.pdf>

Berg, Joyce E. and Thomas A. Rietz (2006), "The Iowa Electronic Markets: Stylized Facts and Open Issues", in Hahn and Tetlock (eds), *Information Markets: A New Way of Making Decisions in the Public and Private Sectors*.

<http://www.aei-brookings.org/admin/authorpdfs/page.php?id=1310>

10.J.ii Historical Election Betting

Strumpf, Koleman and Paul Rhode (2004), "Historical Presidential Betting Markets", *Journal of Economic Perspectives*, 18(2), 127-142.

[http://links.jstor.org/sici?sici=0895-](http://links.jstor.org/sici?sici=0895-3309%28200421%2918%3A2%3C127%3AHPBM%3E2.0.CO%3B2-4)

[3309%28200421%2918%3A2%3C127%3AHPBM%3E2.0.CO%3B2-4](http://links.jstor.org/sici?sici=0895-3309%28200421%2918%3A2%3C127%3AHPBM%3E2.0.CO%3B2-4)

Strumpf, Koleman and Paul Rhode (2007), "Manipulating Political Stock Markets: A Field Experiment and a Century of Observational Data", *mimeo*, Kansas University.

http://www.unc.edu/~cigar/papers/ManipHIT_Jan2007.pdf

10.J.iii Electoral Prediction Markets and the Aggregate Stock Market

Snowberg, Erik, Justin Wolfers and Eric Zitzewitz (2007), "Partisan Impacts on the Economy: Evidence from Prediction Markets and Close Elections", *Quarterly Journal of Economics*, 122(2)

<http://bpp.wharton.upenn.edu/jwolfers/Papers/Snowberg-Wolfers-Zitzewitz%20-%20Close%20Elections.pdf>

Snowberg, Erik, Justin Wolfers and Eric Zitzewitz (2006), "Party Influence in Congress and the Economy", *NBER Working Paper #12751*

<http://bpp.wharton.upenn.edu/jwolfers/Papers/2006Election.pdf>

10.J.iv Electoral Prediction Markets and Stock and Bond Markets

Slemrod, Joel and Timothy Greimel (1999), "Did Steve Forbes Scare the Municipal Bond Market?", *Journal of Public Economics*, 74(1), 81-96.

[http://doi:10.1016/S0047-2727\(99\)00019-5](http://doi:10.1016/S0047-2727(99)00019-5)

Knight, Brian (2006), “Are Policy Platforms Capitalized into Equity Prices? Evidence from the Bush/Goore 2000 Presidential Election”, *Journal of Public Economic*, 90(4-5).
<http://doi:10.1016/j.jpubeco.2005.06.003>

10.J.v Using Prediction Markets for Forecast the Economy

Wolfers, Justin and Refet Gurkaynak (2005), “Macroeconomic Derivatives: An Initial Analysis of Market-Based Macro Forecasts, Uncertainty and Risk”, *NBER International Seminar on Macroeconomics*.

<http://bpp.wharton.upenn.edu/jwolfers/Papers/EconomicDerivatives.pdf>

10.J.vi Corporate Prediction Markets

Chen, Kay-Yut and Charles R. Plott (2002) “Information Aggregation Mechanisms: Concept, Design, and Implementation for a Sales Forecasting Problem, CalTech Social Science Working Paper #1131.

http://www.hpl.hp.com/personal/Kay-Yut_Chen/paper/ms020408.pdf

Cowgill, Bo, Justin Wolfers and Eric Zitzewitz (2008), “Using Prediction Markets to Track Information Flows: Evidence from Google”.

<http://bocowgill.com/GooglePredictionMarketPaper.pdf>

11 & 12. STUDENT PRESENTATIONS: WHAT DO THE DATA SAY? Note that this will be a 4 hour session.

11. What have we learned?: A short review of the key concepts covered in class

12. Research Presentations

This is the main assignment of your class. Each study group will be asked to present the results of their analysis of data on their chosen sport or research question.

Please focus your presentation on the following questions:

- What trading systems did your investigate?
- Why investigate these systems? (That is, what was the motivating psychology behind your choices?)
- What did you learn?
- Conclusions
- Direction for further research