Comments on:

1. Alexander Koch & Hui-Fai Shing:
   “Bookmaker and Pari-Mutuel Betting: Is a (Reverse) Favourite-Longshot Bias Built-in?”
2. Tom Gruca and Joyce Berg:
   “Public Signal Bias and Prediction Market Accuracy”
3. Lionel Page:
   “Ignorance Prior Bias in Prediction Markets”

Justin Wolfers
The Wharton School, University of Pennsylvania
CEPR, IZA & NBER
Koch and Shing: Exploring the Odds Grid

- Explore the effects of the “coarseness” of allowable odds
- Bookmakers: “Grid” of allowable odds yields:
  - Fine distinctions among favorites
    ($1.19 or $1.10 pay 2/11 and 1/10, respectively)
  - Coarse distinctions among longshots
    (500/1 or 990/1 both pay 500/1)
    → Hurts longshots more → Favorite-longshot bias
- Parimutuel system. “Breakage” yields:
  - Coarse distinctions among favorites
    (Payoffs of $1.19 or $1.10 both pay $1.10)
  - Fine distinctions among longshots
    (500/1 or 990/1 pay 500/1 or 990/1)
    → Hurts favorites more → Reverse longshot bias
- Is the “grid” of allowable odds actually as characterized?
  - Why is it an equilibrium?
- Implication: Longshot bias depends on market structure
  - But is this counterfactual?
Justin Wolfers,
Comments on Prediction Markets

Favorite-Longshot Bias Across Countries

Break Even

Rate of Return per Dollar Bet (%)

Australian Bookmakers competing with Parimutuel: 1991-2004
UK Bookmakers: 1994-2004
Favorite-Longshot Bias: Historical Estimates

Data Source
- Griffith, Am. J. Psych 1949
- McGlothlin, Am. J. Psych 1956
- Weitzman, JPE 1965
- Harville, JASA 1973
- Ali, JPE 1977
- Snyder, JF 1978
- Asch, Malkiel and Quandt, JFE 1982
- Jullien and Salanie, JPE 2000
Koch & Shing: Conclusions

☐ More generally: Is the relevant research puzzle:
  – Difference in the favorite-longshot bias across markets?
  – Or similarities?

☐ Favorite-Longshot Bias is a **quantitative** puzzle
  – Does this paper explain the magnitudes?

☐ Are betting odds as coarse as suggested?

☐ Model test: Impact of BetFair on Favorite bias

*Figure 3: Actual FL bias present in UK horse races vs model-based simulation*

*Figure 6: Model-based simulation for UK Tote grid*
Contrasts two theories:
- Miscalibration over small probabilities
- Ignorance prior bias (should decrease with info)

Analyzes Tradesports prices on 500 sporting events.

Observes: Favorite-longshot bias becomes more pronounced through time.
What does the time dimension yield?

- More time => More info
  » Definitely true: Ignorance prior should be less relevant
  » But: Regressions test ignorance prior bias
  » Question: Should ignorance prior bias decline through time?

- Miscalibration over small probabilities
  » Authors argue that this should be time-invariant. Why?
    ◆ This paper simply falsifies any theory which asserts that probability-weighting is time-invariant
  » Complementary/competing hypothesis:
    Errors in small probabilities v. Errors in future volatility
    ◆ Overweighting future volatility ↔ Underbet likely events
Political prediction markets:
- Leigh, Wolfers, Zitzewitz (this conference) find some evidence of increasing F-L bias through time

Finance-related prediction markets:
- Zitzewitz, “Price Discovery Among the Punters”
- Finds declining F-L bias through time (InTrade.com)

<table>
<thead>
<tr>
<th>Table 5. DJIA Binary Option Returns by Hour and Moneyness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Longshots</strong></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Trade time</td>
</tr>
<tr>
<td>Contracts expiring at 10 AM ET</td>
</tr>
<tr>
<td>Before 7 AM</td>
</tr>
<tr>
<td>7 to 8 AM</td>
</tr>
<tr>
<td>8 to 9 AM</td>
</tr>
<tr>
<td>9 to 10 AM</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
Their idea:

- **H1:** If public signals are biased: Markets will correct bias
  ⇒ Markets outperform public signal

- **H2:** If public signals are unbiased:
  - Gruca & Berg: ⇒ markets will not outperform public signals
  - But: A⇒B does NOT imply: Not A⇒Not B
  - Performance of markets v. polls must depend on private signals
    » eg Public signals about flu outbreaks are unbiased
      But markets appear to forecast the flu better than others

- **What I like best:**
  - The idea that one role of markets is de-biasing
    » Idea is implicit in Erikson and Wlezien’s analysis of markets v. polls
    » The idea has much broader applicability (eg litigation)
Gruca & Berg: Polls v. Markets

Gruca & Berg:
- Polls are biased for incumbents
- Polls unbiased for challengers
- And markets beat polls for challengers, but not incumbents

But: How can a poll be unbiased for an incumbent, but biased for his challenger?
- Need to normalize polls
- Especially when markets and outcomes are normalized
Gruca & Berg: IEM v. HSX

- Gruca & Berg:
  - HSX is unbiased
  - Iowa market does not outperform Hollywood Stock Exchange
  - Confirming: In the presence of an unbiased public signal markets aren’t better

- But: Isn’t this just a comparison of real-money v. play-money markets?

- Surely markets do better than some “experts”
What do Traders Do?

- Contract pays $1 if event occurs
- Many traders, each characterized by:
  - \( q \): Subjective beliefs about prob. event occurs
  - \( y \): Wealth
  - \( U \): Utility function (Log utility)
- Traders: Maximize expected utility
  - Choose \( X \): How many contracts to buy/sell,
  - Given \( \pi \), the price

\[
\begin{align*}
\text{Max } EU_j &= q_j \log(y + x_j(1 - \pi)) + (1 - q_j) \log(y - x_j \pi) \\
\end{align*}
\]

yielding: \( x_j^* = y \frac{q_j - \pi}{\pi(1 - \pi)} \)
What do Markets Do?

- Supply = Demand ($\sum x(\pi) = 0$)
  \[
  \int_{-\infty}^{\infty} y \frac{q - \pi}{\pi(1 - \pi)} f(q) dq = \int_{-\infty}^{\infty} y \frac{\pi - q}{\pi(1 - \pi)} f(q) dq
  \]

- Implies: **Price = Mean belief**
  \[
  \pi = \int_{-\infty}^{\infty} q f(q) dq = \bar{q}
  \]

- And if beliefs ($q$) are correlated with wealth ($y$)
  \[
  \int_{-\infty}^{\infty} y \frac{q - \pi}{\pi(1 - \pi)} dF(q \leq \pi, y) = \int_{-\infty}^{\infty} y \frac{\pi - q}{\pi(1 - \pi)} dF(q \geq \pi, y)
  \]
  \[
  \pi = \int q \frac{y}{\bar{y}} dF(q, y)
  \]
  = **Wealth-weighted mean belief**

*Justin Wolfers, Comments on Prediction Markets*